ELECTRICAL REVIEW

ILLUSTRATED.

A WEEKLY JOURNAL OF

Electric Light, Power, Telephone, Telegraph and Scientific Progress.

VOL. 21. No. 22. WEEKLY. | NEW YORK, SATURDAY, JANUARY 21, 1893. | $3 per Annum. Single Copies, 10 Cents.

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Entered at Post Office, New York, as Mail Matter of the Second Class.

VIEWS, NEWS AND INTERVIEWS.

A real estate agent of this city proposes to remodel antique office buildings on the electrical plan. He has one building in view in which he proposes to install electric elevators, electric lights, electric fans and electric heaters. There is, at present, a large steam plant in the basement of the building which is lying idle. The real estate agent proposes to utilize this plant for the generation of electric power to be distributed to manufacturing concerns in the same block with the office building. His idea is that the advantages of a building equipped with modern electrical conveniences will appeal forcibly to the tenant.

Vice-President Orr, of the New York Chamber of Commerce, has appointed the following committee to consider ways for entertaining foreign visitors to the World's Fair: Henry Villard, D. Willis James, Seth Low, Carl Schurz and Woodbury Langdon.

Since the late cholera epidemic at Havre and Rouen, the Prefect of Seine-Inférieure has been investigating electrical methods of disinfection. *Figaro*, in a recent number, has drawn the attention of the French nation very forcibly to this scheme, and it may be well if other nations devoted a little attention to the project. The process of M. Hermite, of treating sea water electrically, is the method alluded to, and M. Gautier, the writer of the article, is urgent in his suggestions that the commissions of Havre and Toulon and other ports open to infection should adopt some such means of dealing with the sanitary state of those towns.

The Compagnie Transatlantique has again brought forward the question of lighting the Atlantic route from Ireland to Newfoundland. It is proposed to moor 10 powerful floating lights 200 miles apart and connect them by electric cables.

The imagined description of the coast of all lands near which ships steam as surrounded by a ring of arc lamps, seems to be considered within the sphere of practical politics, not only with regard to the Suez Canal, but with the dangerous Straits of Magellan. The Chilian government are reported to be considering the question, and many a captain's heart would feel lighter if this modern Scylla and Charybdis were illuminated in the way suggested, says a foreign exchange.

It is the proud boast of the Atchison, Kas., newspapers that the electric cars in that town never run away, although some of the outfits that come in occasionally from the Missouri bottoms across the river are enough to scare even a street railway.

One of the scenic novelties in a London pantomime is a "tableau curtain of crystal prisms," held together by 24 miles of wire, and illuminated by electric lights. It is said to be marvellously effective.

In a report for submission to Mayor Boody the Brooklyn Subway Commission recommends that all the railroad and illuminating companies should place their wires underground.

The Telephone in Chicago During the World's Fair.

The critical condition of telephone affairs in Chicago, in view of the approach of the rush of business which will be attendant upon the opening of the World's Fair, is commanding the best attention of the highest talent engaged in this field of electrical engineering. That the authorities of the American Bell Telephone Company are fully alive to the importance of the situation in the World's Fair city, is evidenced by the fact that within a short time the president of that company has spent some time in Chicago making a personal investigation, and he was accompanied by the chief engineer of the Bell Company, Mr. Davis. Subsequently Mr. Lockwood, electrician of the American Bell Telephone Company, spent some time in Chicago investigating the conditions and problems which confront the local company, as did also Mr. A. S. Hibbard, general superintendent of the American Bell Telephone and Telegraph Company, otherwise called the Long Distance Company. The opening of telephonic communication with Boston and New York enables the experts and authorities residing in those cities to keep in touch with the local representation and experts in Chicago, and great use of these facilities is made for the purpose of preparing, as well as money and the best talent obtainable can prepare, for the approaching crisis. Several changes in the Chicago Telephone Company's staff have been made.

The crisis in Chicago has a two-fold importance, resulting from the enormous growth of the business in the past, and the prospect of abnormal growth during the year 1893, and from the fact that just at this juncture the original Bell patent will expire. It would seem that the most important point, telephonically considered, in the world just now is Chicago, and it is toward this city that all eyes will be turned for the next year for interesting news in this line. —*World's Fair Electrical Engineering.*

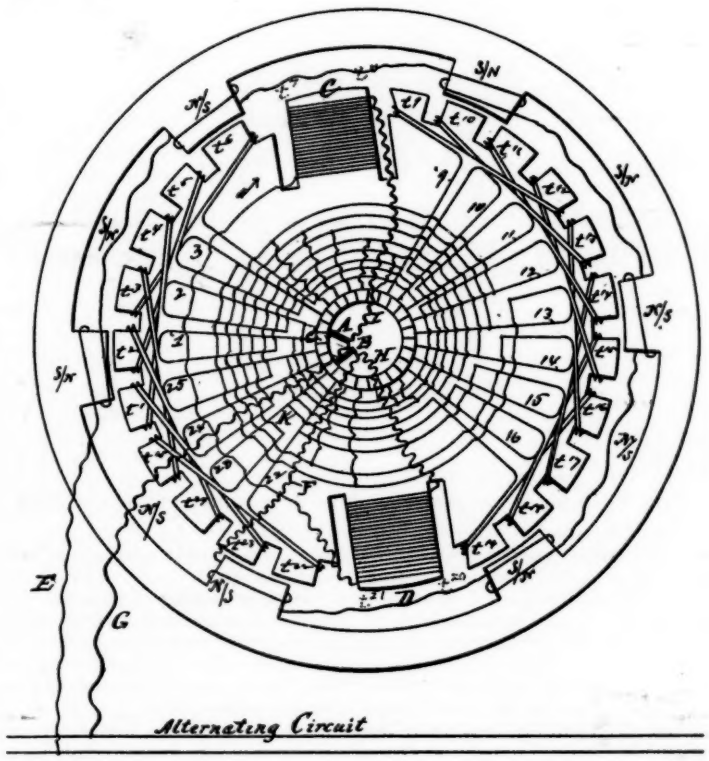


Fig. 1.—Bradley's Single Phase Alternating Current Motor.

Fort Wayne Company's Loss.

The fire loss of the Fort Wayne Electric Company has been satisfactorily adjusted at $32,625. The work of repairing is rapidly progressing, and there will be little delay in manufacturing, and none in the shipment of orders.

Alternating Current Motors.

RECENT INVENTIONS OF MR. CHARLES S. BRADLEY.

A single phase alternating current motor of high efficiency is something which has been eagerly sought after by inventors since alternating currents have come into use for lighting. The high degree of self-induction of such motors renders them of such low efficiency that their use has been restricted heretofore for operating fans and other light work. Every invention aiming at a solution of this problem and which promises a fair degree of success is eagerly inquired into by electricians. Among the motors of this class is one recently patented by Mr. Bradley, whose polyphase system of distribution has just been noticed. This motor is illustrated in the accompanying engraving. It comprises a combined self-starting and synchronous motor, the object being to render the machine self-starting, and when it gets up to a synchronous speed to have it operate as a synchronous motor, the latter type, as is well known, being highly efficient in its operation and comparable in this respect to direct current motors. The difficulty experienced in operating synchronous motors is that they will not start from a state of rest, or when, by reason of an overload, they are thrown out of synchronism, they will not restart, but will gradually fall in speed until they come to rest. This motor is wound in such a way as to develop a high counter-electromotive force in starting, acting upon a principle disclosed in a former patent of the inventor and described in these columns on October 3, 1891. The field magnet comprises a series of pole pieces which confront a toothed armature provided with a closed coil winding, adapted to produce a multiplicity of poles to correspond with the field magnet. The large number of poles used develops a high counter-electromotive force at low speed, which eliminates almost entirely self-induction from the armature and enables the latter to gradually rise in speed until it attains synchronism. The armature is made up of a series of laminæ of iron, and, as shown in the engraving, is provided with 25 teeth. A greater or smaller number of teeth might be used, the number being determined by a multiple of the number of field magnet poles, plus or minus one. For example, in a six-pole machine with 25 teeth on the armature, there are $4 \times 6 + 1$, or 25 teeth, four teeth being allotted to each pole. There are as many commutator blocks as there are teeth. In winding the armature, if we start from any given block on the commutator, as, for example, 1, a number of courses of wire are laid in grooves inclosing four teeth, and are then carried past four teeth and wound about a group of four teeth beyond, after which another group of four is skipped and the wire laid about the fifth group, and it is thus carried around the armature, being laid in grooves forming four teeth successively until all of the notches have been filled. It is evident that as there are 25 notches, and each course of wire encloses four teeth, that two successive courses will not lie in the same grooves. The first layer will cover groups

t^1 to t^4, t^9 to t^{12}, t^{17} to t^{20}. The next layer will cover t^{25} to t^3, t^8 to t^{11}, t^{16} to t^{19}. The space occupied by several of the teeth, say teeth 7 and 8, and 20 and 21, is allotted two pole pieces, C and D, designed to contain the synchronous winding, and in laying on the wire care is observed that when any group of teeth includes any of the toothed spaces occupied by the poles C and D, to skip forward on the armature to a group of teeth of the same sign which will occupy such a position that a full group may be covered by the winding. For example, the group t^{17} to t^{20} would include part of the space occupied by pole-piece D. A simple connection with the commutator block t^{17} is, therefore, made, and the wire carried forward and laid about the group of teeth from t^{25} to t^3, the winding being continued in this manner until all the grooves are filled. When any of the commutator blocks corresponding to the spaces occupied by poles C and D come into contact with the brushes, the current will thus enter the winding at a proper point to develop the armature poles in an operative relation to the field-magnet poles. It results from this structure that as the armature revolves the armature poles are maintained within a fixed limit of the field-magnet poles, the same as in a continuous current motor. The field-magnet and armature are in series relation, current entering the motor by the conductor E, flowing through the field-magnet coils, developing north and south poles, then entering the armature through conductor F and brush B, divides at K, and passing around the armature in opposite directions in a manner similar to a Gramme winding, reunites at brush A and returns by conductor G. The two branches of the current develop north and south poles in adjacent parts of the armature on opposite sides of any field-magnet pole. When a brush passes from one commutator segment to the next the poles will be shifted backward a distance of one tooth, and this operation will be repeated continuously during the operation of the motor. In shunt relation to the brushes is placed the synchronous circuit which is wound about the pole-pieces C and D. When the motor is started, by reason of the great self-induction of this shunt circuit, almost no current will flow through it. The continuous winding being then of low counter-electromotive force will carry the bulk of the current. As the motor speeds up, the counter-electromotive force of the closed coil winding forces more and more current into the synchronous winding, and as the synchronous winding is gradually offering less self-induction as synchronism is approached, it takes more and more current. Finally, when synchronism is attained the closed coil winding will be taking almost no current, while the synchronous winding will be drawing almost all the current, and the motor will be operating at the high efficiency common to synchronous motors. The distribution of poles developed by the synchronous winding over the pole pieces C and D is illustrated in the detached view.

A distinctively different type of motor, invented by Mr. Bradley, is illustrated in Fig. 2. This motor is of a differential phase type and is designed to be operated by two quarter-phase currents. The machine has two revolving parts, each made up of a number of cores provided with a winding, and arranged in the form of a crown with the free poles all in one direction and radial yokes serving to mechanically connect the same to the shaft. The cores are laminated as is usual in constructing alternating current motors. Two such crowns are attached to separate shafts A, A^1, which are arranged in line with each other, and the free poles brought into close proximity. Each crown has an even number of electro-magnets. In the drawing is shown a crown consisting of 20 magnets. The alternate magnets are connected in two series supplied by the two differential phase currents. These two series are indicated by letters and numbers in the detached diagram. The fluctuation of the two phasially different currents develops a rotation of the polar points in the two crowns, a polar wave being caused to rotate about the crown from left to right, or right to left, according to which of the two currents lags behind the other. Assuming the direction indicated by the full arrow to be the direction in one crown, and that indicated by the dotted arrow to be the direction in the other, the two polar waves will sweep in opposite directions. The reaction between the two sets of poles produces rotation.

The Transformation of Energy.—Joule's Discovery.

BY V. E. JOHNSON, M.A.

The following is a brief abstract of an article which appeared under this heading in a recent number of the *Westminster Review*, London:

When we say that any one is full of energy, we mean, do we not, that they are full of the power of doing work? And when we say that a thing is full of energy, we mean that it is full of the power of doing work, and we estimate the energy which it possesses by the amount of work which it can do before it is utterly spent.

Now, it is very easy to see that a moving body possesses energy, but we may also have energy in a quiescent state. Suppose, for example, I carry a stone weight to the top of a high tower, and place it on a ledge there, the stone would possess a certain amount of energy or power of work in virtue of its *position*, for if I were to push it over the edge it would at once fall to the ground beneath, and, by virtue of the motion acquired in falling, be made do a certain amount of work.

The energy possessed by this stone weight in virtue of its position is called *potential* energy. The energy which I expended in carrying it to the top of the tower is actual or kinetic energy.

I have said that in falling, the stone will perform a certain amount of work; now the amount of work which it will perform is exactly equivalent to the work which I performed in carrying it to the top of the tower, and this stone weight while at the top of the tower possesses a "potential energy" or "energy of position" equal in amount to the actual or kinetic energy expended by myself in carrying up the weight.

There is no creation of energy; neither the steam engine, electro-dynamo, human muscle, nor any mechanical contrivance which can create force. All we can do is to transform one kind of energy into another more convenient to us, and similarly in all machines or combinations of machines the law is universally true that "when we gain in power we lose in space," or that the power multiplied into the distance it descends is always equal to the weight multiplied into the distance that it ascends—neglecting friction.

It is chiefly due to the labors of Mr. James Prescott Joule, of Manchester, that these doctrines were transferred from the realm of speculation to the sure basis of experimental fact.

To produce a certain amount of one kind of energy, the equivalent amount of another kind of energy is always necessary, and we are led to the great principle of the conservation of energy, than which no truth stands on a firmer scientific basis.

"Work is worship," says an old proverb. "Work is a necessity" is the doctrine of modern science. "For a certain amount of one kind of energy, I will give you," says Nature, "so much of the other kind of energy; no more and no less." For a certain amount of work to be done (without injury or waste to the system), a certain quantity of food must be digested. It is the *combustion* of the food in our system that furnishes the energy of our bodies, and any food capable of nourishing our bodies may, if well dried, be burned in the fire.

In every case this food derives its energy from the sun. Apart from organic energy, the other sources of energy in nature available to man for the production of mechanical effect are rain, the tides, the air in motion and fuel. Coal and wood are now the prime sources of available energy, and they are rapidly being exhausted. In 10 or 12 generations, if not earlier, the coal fields of Great Britain will be exhausted. Similarly, too, with the forests, which are being wantonly destroyed.

No *fresh* energy is being created by the earth. At her birth she possessed a certain amount, which is rapidly being radiated into space like that of the sun. The death of the earth and the sun must both come, and with their death the end of all life on earth. But the human race of to-day is providing for its own extinction long before either of these events come to pass.

No fallacy can be greater than to suppose that any scientific discovery can avert this disaster, because every such discovery only leads to a more rapid exhaustion of earth's garnered stores.

The offspring of the people of the United States alone, at their present rate of increase, would, in four centuries, if all other races were to die out, cover the whole habitable globe, allowing each person only 27 square feet of surface.

If, then, we continue to multiply and to consume the earth's stores of life-supporting energy as we are now doing, the human race cannot do otherwise than come to an untimely end.

We should endeavor, also, when possible, to borrow, not to spend, that those same agencies in Nature which make exhausted land again become fertile may come into play, and by their action maintain the fertility of the soil. The waste of combustible materials of which we are now guilty is utterly inconsistent with our claim to be responsible beings—"Intellectual heirs of all the Ages"—holding the accumulated stores of Nature in trust.

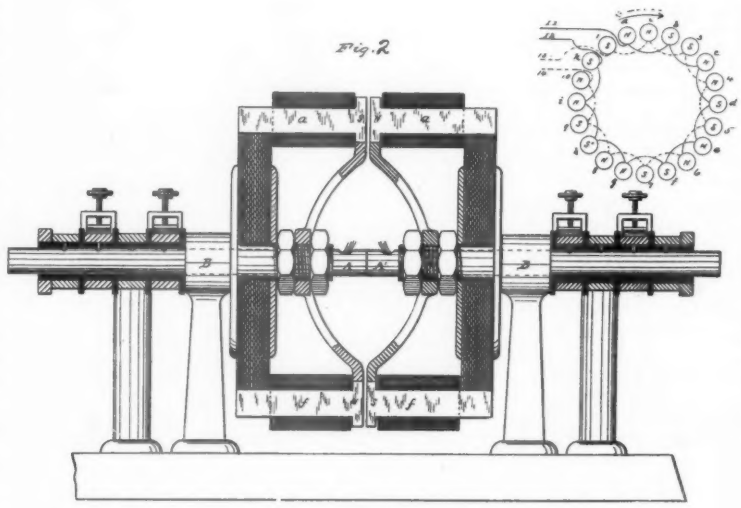


FIG. 2.—BRADLEY'S DIFFERENTIAL PHASE ALTERNATING CURRENT MOTOR.

Long Sparks.

The Thomson Scientific Club held its first meeting of the new year at Lynn, Mass., on January 5. Professor Thomson gave a most interesting talk on "The Induction Coil." He stated that he has succeeded in experiments in which electric currents of high voltage were discharged through five feet of air, and expressed confidence in his ability to construct a machine which shall cause veritable thunderbolts to leap as far as 50 feet in air.

Mountain's Method of Manufacturing Wire.

A NEW AND IMPORTANT PROCESS.

In the *Revue Universelle des Mines* Mr. Goffin describes a new process of manufacturing wire, invented by M. B. Mountain, of Castleford, Yorkshire. It is strange that this useful and practical method has not yet been discussed in American technical journals, and it seems timely to invite the close attention of our manufacturers to this new process.

At present iron wire is made in the following manner: Blooms of iron (25-30 mm. by 60cm. to 1 meter) are raised to white heat. Their diameter is then reduced to 6 or 7 mm. by drawing; the wire so obtained is coiled, annealed in a suitable furnace and is then drawn through several dies to the proper size.

In the manufacture of copper, lead, phosphor-bronze, or other alloys, the metal, or the alloy, is placed in plumbago crucibles and liquefied. The liquid metal is then run into bars in cast ingot moulds. The bars are brought to the rolling mills, rolled into strips of 8 mm., and finally drawn into wire.

Entirely different from the above outlined process is that invented by M. B. Mountain. First the metal is liquefied in proper furnaces and flows directly into an annular mould which turns with great rapidity. By centrifugal force the metal is projected against the interior walls of the mould, which it covers with a layer of uniform thickness. The metallic cylinder thus obtained is brought into a hydraulic rolling mill which may either reduce or increase its diameter. By means of special machinery, the ring or cylinder is now spirally cut, producing thereby a continuous wire of great length, equal in weight to the weight of the original ingot. The wire is then cleaned and drawn to size.

It will be noted that this process allows the manufacture of wire of very great length and, when finished, always represents the original weight of the ingot. The inventor states that while according to the old method employed in the manufacture of lead or copper alloys, an ingot weighing 10 pounds was cut into 23 pieces and rolled, producing coils of wire, each coil weighing about four pounds and a-half, he now is enabled to produce coils weighing from 60 to 70 pounds. Indeed he claims that the continuous length of wire which can be manufactured in this way is unlimited. This discovery is, of course, of special importance to telegraph and telephone companies, as it will enable the construction of lines containing but a few joints or splices, which latter have always been the bane of the electrical engineer.

Baltimore Tunnel Ventilating Plant.

The plant for ventilating the tunnel of the Pennsylvania Railroad Company, in Baltimore, is now completed. At a point midway of the tunnel, a large stack is constructed, and adjacent to it a small motor room. The stack is not directly over the tunnel, but is built to one side of it, and the gases are led to the stack by a shaft entering the side of the tunnel on a slope. At the base of the stack is a fan 15 feet in diameter, designed to run at the rate of 130 revolutions per minute. It is driven by a Thomson-Houston 20 horse power electric motor, belted to a countershaft, from which a quarter twist belt leads to the fan shaft, which is vertical. The electric current is generated in a special power house near the end of the tunnel, and so near the depot and yards that the same power plant will eventually be used to light these. The current for the fan is supplied by an 80 horse-power Ball engine and a 65 horse-power dynamo. The ventilating stack is 20 feet square outside, 13 feet 7 inches inside, and 100 feet high above the street. The rails at that point are about 30 feet below the street. The floor of the motor room is about 10 feet below the street, the "fan floor" in the base of the stack being about eight feet lower.

ELECTRIC RAILWAY AND POWER NOTES.

Middletown, N. J., citizens are agitating an electric street railway.

A system of electric railways now extends from Lowell, Mass., to the sea.

The question of how to properly heat the Cincinnati street cars is being discussed.

The electric railways at Pueblo, Colo., will be put in repair under a new management.

An electric railroad will be built from Prairie Creek to the House of Correction at Ionia, O.

It is probable that the Wauwatosa electric railway will be extended to North Greenfield, Wis.

The people of Beverly want the Lynn and Boston Electric Railway extended to their town.

The electric road between Hornellsville and Canisteo, N. Y., will be immediately completed.

The electric cars of South Bethlehem, Pa., are winning additional popularity by killing off stray dogs.

During the next 90 days $50,000 will be spent in improving the electric railway system at Pueblo, Colo.

It is said that the prospect for building the proposed electric railway from Cincinnati to Dayton, O., is very good.

The opposition to the trolley seems to have turned a complete backward somersault and dissolved in mid-air.—*Philadelphia Record.*

Two more of the street railway companies of Philadelphia have come out for the trolley system—the People's and the Hestonville lines.

The Consumers' Electric Railway and Power Company, of Tampa, Fla., are moving on with their plant and the laying of their railroad tracks at a rapid rate.

A trolley road from Norristown to Wissahickon, within the Philadelphia city limits, seems to be reasonably assured, if the plans of the projectors do not go awry.

The Flatbush, L. I., Town Board has granted a franchise for a street railway across the town to the Kings County Electric Railway. The trolley system will be used.

The St. Joe-Benton Harbor Electric Street Railroad Company in its suit for $20,000 damages against the city of St. Joe, for cutting down some of the company's poles, was awarded six cents damages.

At the annual meeting of the board of directors of the Second and Third Streets Passenger Railway Company, of Philadelphia, the adoption of the trolley on their road was favorably considered.

E. D. Lundy and J. M. Atkinson, of the Westinghouse Electric and Manufacturing Company, have returned to Chicago after a conference in reference to the electrical equipment of the elevated road at Sioux City, Ia.

The General Electric Company has nearly completed plans for the power station of the Intramural Elevated Railroad at Jackson Park, Chicago, which will be run for business and exhibition purposes at the World's Fair.

The directors of the Worcester, Leicester and Spencer, Mass., Street Railway Company, have received word that the selectmen of Southbridge have granted them a franchise for an electric railway in that town as petitioned for.

The electric railway between Brighton and Denver, Colo., that has agitated the minds of the people along the Platte Valley more or less for several years, is just now all the talk, and the indications are that the road will be built during the coming summer.

The Jersey City and Bergen Railroad Company put electric cars on the Montgomery street line on January 12. This is the first instalment of the rapid transit which President Charles B. Thurston proposes to extend all over the company's lines as quickly as the work can be done.

The Norfolk and Western Railroad has adopted as its standard a rail 60 feet long, thus decreasing by half the number of joints at present required. The joints are of a special type designed by Mr. C. S. Churchill, the permanent way engineer of the road. There may be a point for electric railway constructors in this new departure.

The Steinway system of street railways, running from Long Island City to Astoria, has been sold to R. P. McCabe, Benjamin Orne, and Gardner Van Nostrand of New York city. The trolley system will be substituted for horses in operating the lines. The lines cover about 30 miles of streets. Mr. Steinway will continue as president of the company.

Mr. B. C. Seaton, of Nashville, Tenn., has invented a railroad danger signal similar to one described in the ELECTRICAL REVIEW some time ago. The system upon which the device acts is shown by two locomotive models on a line of track with a double but smaller rail in the center of the track. Under each locomotive is a contact wheel which runs upon this center track. This center track is broken into short open circuits, so that the approach of trains, either from different directions or the same direction, will close the circuit, and in doing so cause a bell to ring on each engine as a danger signal.

The directors of the Brooklyn City Railroad Company have elected these officers: Daniel F. Lewis, president; E. D. White, vice-president; H. A. Bogardus, secretary; Thomas P. Swin, assistant secretary; Crowell Haddon, auditor. Mr. Bogardus, the only new man in the list, takes the place of Mr. Thompson, who resigned the secretaryship a few months ago. Mr. Bogardus came from Chicago, where he had long been chief clerk for Armour & Company, and he is supposed to represent the syndicate which recently secured a big slice of the City Railroad stock. There is no longer any doubt that plans are rapidly being perfected for the consolidation of all the Brooklyn surface roads under one management. The Brooklyn Traction Company, it is said, is to be the name of the new corporation.

Worcester, Mass., will be the center of the largest single suburban system of electric roads in this country, provided present intentions are carried out. The new scheme comprises the joining together of 75 to 80 miles of track under one management, which will constitute a great web connecting the towns surrounding Worcester, and having the latter city as its common center. The Central Massachusetts Street Railway Company is the concern which will control and operate the various lines which are to be consolidated. The amount necessary to complete the project is between $800,000 and $1,000,000, and, as most of the stock has been subscribed, the company will begin work at once as soon as the necessary legislation is enacted. The cities and towns included in the entire system had a population, in 1890, of 155,575, but this has greatly increased since then, Worcester alone having nearly 95,000.

Large Sale of Electric Stock.

The largest block of stock ever sold at an auction sale was sold last week by R. V. Harnett & Company, at the Real Estate Exchange, in Liberty street, New York. The sale was of 20,500 shares of the United States Portelectric Company of $100 each.

The stock was sold in a lump, and the bidding, which started at $10 for the whole lot, finally ran up to $1,800,000, at which price it was knocked down to J. S. Goldsmith. The sale was ordered by the International Portelectric Company, the parent company of the United States Company.

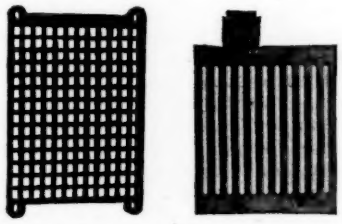
As soon as the sale was over, C. F. James, secretary and treasurer of the United States Company, served notice on Auctioneer Harnett that he objected to the sale on the grounds of insufficient notice and lack of legal right on the part of the seller.

A Practical Test of the Acme Storage Battery.

A car equipped with Acme storage batteries was put through a practical test on the lines of the Ninth Avenue Surface Street Railway on January 12. The route traversed was from the car stables, at Fifty-third street, up Ninth avenue and Amsterdam avenue to 125th street and return. A grade of six per cent., about half a mile long, was mounted with ease at a speed of about six miles per hour.

The battery equipment consisted of 144 Acme cells placed under the seats of the car in sets of 12, six sets being carried on a side. The batteries were charged at the car stables from a generator of special design, built by Mr. Townsend Wolcott, the consulting electrician for the Acme Storage Battery Company. The passenger equipment on the trial trip was made up of about 20 newspaper men and several officers of the company.

The Acme cell weighs 27 pounds, against 40 pounds for a cell of the same dimensions using lead grids. The grids are of a non-conducting material, which, it is claimed, is not attacked by the acid, and which is sufficiently elastic to yield to the expansion of the active material without buckling, warping or breaking. On the other hand, the active material is retained with sufficient firmness in contact with the conducting plate of lead, which is situated in the middle of the complete plate. There is an equal amount of active material on each side of



LEAD PLATE AND GRID OF THE ACME STORAGE BATTERY.

this lead conducting plate, thus insuring an equal distribution of current. Ribs on the non-conducting grids meet through slots in the conducting plate, and are cemented together, uniting the whole into one solid plate. The openings for the reception of active material are smaller on the outside to aid in the retention of their contents. The exposed surface of active material is about 40 square inches on each plate, or about 200 square inches for the five positives. The maximum steady discharge on the six per cent. grade was 130 amperes or about 65 amperes per square inch.

The trial car, as equipped, will run for three hours at seven miles per hour without a change of batteries. The change of batteries is effected in the usual manner through panels in the sides of the car, and occupies about 2½ minutes. The car was fitted with a Baker truck and one 20 horse-power McDougall motor. The batteries weighed about 3,800 pounds in the aggregate.

The Acme storage battery is the invention of Patrick Kennedy and Charles J. Diss, of Brooklyn, and the patents are owned by the Acme Storage Battery Company, 29 Broadway, New York. The officers of the company are Geo. C. Warner, president; Wm. K. Fletcher, vice-president; and C. T. Griffiths, secretary and treasurer. A company controlling the same patents has been organized in England, and it is expected that both companies will be successful in introducing the system in this city and in England.

New York Electric Club.

The Board of Managers of the New York Electric Club have decided to wind up the affairs of the organization, and to that end have petitioned for the appointment of George M. Phelps, the treasurer of the club, as receiver. Judge Daly, of the Court of Common Pleas, has appointed Stephen H. Olin a referee to hear objections on April 20, at 32 Nassau street, why the club should not dissolve.

The Ewing High-Frequency Alternator and Parsons Steam Turbine.

Mr. Nikola Tesla has sent the following interesting communication to the editor of the London *Electrician:*

In your issue of November 18 I find a description of Prof. Ewing's high-frequency alternator, which has pleased me chiefly because it conveyed to me the knowledge that he, and with him, no doubt, other scientific men, is to investigate the properties of high-frequency currents. With apparatus such as you describe, shortly a number of experimenters, more competent than myself, will be enabled to go over the ground as yet but imperfectly explored, which will undoubtedly result in the observation of novel facts and elimination of eventual errors.

I hope it will not be interpreted as my wishing to detract anything from Prof. Ewing's merit if I state the fact that for a considerable time past I have likewise thought of combining the identical steam turbine with a high-frequency alternator. *Anch' io sono pittore.* I had a number of designs with such turbines, and would have certainly carried them out had the turbines been here easily and cheaply obtainable, and had my attention not been drawn in a different direction. As to the combination, to which you give a rather complicated name, I consider it an excellent one. The advantages of using a high speed turbine are especially great in connection with such alternators. When a belt is used to drive, one must resort to extraordinarily large diameters in order to obtain the necessary speed, and this increases the difficulties and cost of construction in an entirely unreasonable proportion. In the machine used in my recent experiments the weight of the active parts is less than 50 pounds, but there is an additional weight of over 100 pounds in the supporting frame, which a very careful constructor would have probably made much heavier. When running at its maximum speed, and with a proper capacity in the armature circuit, two and one-half horse-power can be performed. The large diameter (30 inches), of course, has the advantage of affording better facility for radiation; but, on the other hand, it is impossible to work with a very small clearance.

I have observed with interest that Prof. Ewing has used a magnet with alternating poles. In my first trials I expected to obtain the best results with a machine of the Mordey type—that is, with one having pole projections of the same polarity. My idea was to energize the field up to the point of the maximum permeability of the iron and vary the induction around that point. But I found that with a very great number of pole projections such a machine would not give good results, although with few projections, and with an armature without iron, as used by Mordey, the results obtained were excellent. Many experiences of similar nature made in the course of my study demonstrate that the ordinary rules for the magnetic circuit do not hold good with high-frequency currents. In ponderable matter magnetic permeability, and also specific inductive capacity, must undergo considerable change when the frequency is varied within wide limits. This would render very difficult the exact determination of the energy dissipated in iron cores by very rapid cycles of magnetization, and of that in conductors and condensers, by very quick reversals of current. Much valuable work remains to be done in these fields, in which it is so easy to observe novel phenomena, but so difficult to make quantitative determinations. The results of Prof. Ewing's systematical research will be awaited with great interest.

It is gratifying to note from his tests that the turbines are being rapidly improved. Though I am aware that the majority of engineers do not favor their adoption, I do not hesitate to say that I believe in their success. I think their principal uses, in no distant future, will be in connection with alternate current motors, by means of which it is easy to obtain a constant and, in any desired ratio, reduced speed. There are objections to their employment for driving direct current generators, as the commutators must be a source of some loss and trouble, on account of the very great speed; but with an alternator there is no objectionable feature whatever. No matter how much one may be opposed to the introduction of the turbine, he must have watches with surprise the development of this curious branch of industry, in which Mr. Parsons has been a pioneer, and everyone must wish him the success which his skill had deserved.

Why a Telegram Shocks.

"It always shocks me to receive a telegram!" she exclaimed. "Do it, really?" exclaimed her uncle from Stump Hollow. "Maybe they ain't keerful ter take all the 'lectricity out 'n 'em."—*Washington Star.*

TELEPHONE CHAT.

Rock Springs, Utah, will have a telephone exchange.

There is a new telephone line, seven miles long, between Marshfield and McMillan, Wis.

The American Telephone and Telegraph Company is stringing four extra wires at Brockton, Mass.

Port Jervis, N. Y., has a new switchboard and other improvements in the telephone system.

The New York and New Jersey Telephone Company has received permission to run lines in the streets of Hoboken, N. J.

The Missouri and Kansas Telephone Company has opened offices in the following Missouri towns: Rosendale, Bolckow, Barnard and Maryville.

There are 125 subscribers to the Johnstown, Pa., central telephone exchange, and the Cambria exchange, which is also connected with the Johnstown central, has 40 'phones.

The workmen of the telephone company, who have put in 23 instruments at Dexter, Me., have left for Presque Isle, where they will put in an exchange, and will also extend the service to Caribou, Fort Fairfield and Houlton.

The New England Telephone and Telegraph Company has put in a new metallic circuit between Boston and Portland, Me., for the exclusive use of brokers. The line is 225 miles in length and passes through Salem, Mass.

The Winnipiseogee, N. H., Bell Telephone Company has sold out to the New England Telephone and Telegraph Company. The latter company already owned all but three of the exchanges belonging to the former company.

President Morris F. Tyler, of the Southern New England Telephone Company, said last week that the company hoped to complete in two years the laying of the metallic circuits which was begun three years ago. In the State of Connecticut there are 5,772 stations, of which 2,524 are metallic. New Haven has the largest number of stations, 1,168, and of these 763 are of the new service. Hartford has 762 stations, nearly one-half of which are metallic, and Bridgeport has 719 stations. Of the 451 stations in Waterbury, less than 100 are metallic. Meriden has 224 stations or subscribers, and one-third of them are on the metallic. One-quarter of the subscribers in Danbury are on the metallic.

The telephone system of Omaha, Neb., is owned and operated by the Nebraska Telephone Company, an Omaha corporation and is officered by Omaha men. The management is as follows: President, Caspar E. Yost; vice-president, J. J. Dickey; secretary and treasurer, L. H. Korty; assistant treasurer, V. P. Musselman; local manager, Vance Lane. During the last year the company has operated 32 exchanges, 59 toll offices and has had 4,427 telephones in use. It has 779½ miles of pole lines and 1,186½ miles of toll line wires. There are 180 regular employés on the pay roll, with 225 during the summer months. The salaries amount to $8,000 per month. Last year the company commenced the erection of a three story, fire-proof, $125,000 exchange building at the corner of Eighteenth and Douglas streets, which will be completed this season.

F. E. Sloat, a well known horseman of Brockport, N. Y., has sued the Bell Telephone Company, of Buffalo, for $20,000 damages, alleged to have been the result of a blunder by an operator in Rochester. Mr. Sloat is the owner of the blooded stallion, Cambria Wilkes. A year ago the horse was injured by an accident, and Sloat sent a telephone message to Dr. Edward Crandall, a veterinary surgeon of Rochester, asking him to come to Brockport on the first train. The receiving operator substituted Fairport for Brockport, and signed the name of F. F. Smith. The message was sent to Dr. Crandall's office, and he went immediately to the New York Central station, only to find that the local train for the East had just gone. A train for Brockport, however, was standing in the station. A messenger was sent after the doctor by Sloat, and the surgeon reached Brockport after several hours' delay, but he was too late to be of aid to the animal. The plaintiff alleges that the injuries would not have resulted seriously if the doctor had arrived promptly.

TELEGRAPH NEWS.

The first telegraph message was sent over the wires forty-nine years ago on January 6.

There is a probability that Kewaunee and Frankfort, Mich., will be connected by a telegraph cable.

The Supreme Court has affirmed the right of Philadelphia to tax telegraph poles erected in that city.

The American District Telegraph will cancel its $6 per year rent for call boxes to patrons whose service averages $25 per year.

Henry J. Kinnucan, local manager of the Postal Telegraph Company, at Detroit, has been appointed assistant superintendent of the first district, Western division, of that system, with headquarters at Detroit.

William R. Benzie, who organized the Postal Telegraph-Cable Company's branch in Denver, two and one-half years ago, and has conducted it efficiently ever since, has resigned to accept a department management in Chicago, his former home. He is succeeded by Mr. Quackenbush, who has been connected for some years with the Chicago and Alton Railroad.

A little wild is the scheme of Cecil Rhodes, prime minister of Cape Colony and manager of the British South Africa Company, to extend a telegraph line from Cape Town to Alexandria *via* Uganda, Khartoum and the towns along the Nile. The line will have to go through the country of the Madhi's successor, but Mr. Rhodes is confident that he can buy Abdallah's consent. A company has been formed, it is stated, with a capital of $2,000,000 to carry the project into effect. It is difficult to see what local business the projected line would get, and more difficult to see how it can hope for a profit on its outlay.

The Dominion Government has taken action in regard to the memorials from Canadian Boards of Trade urging the appointment of a special commission to inquire into the most feasible means of completing the telegraphic system within the empire, including a cable from British Columbia to Australia. The Secretary of State announces that copies of all the documents have been forwarded to the imperial authorities, with an intimation that the Canadian Government would view with satisfaction the appointment of a commission as proposed, and would gladly send and bear the expenses of a delegate to act upon such a commission. The estimated cost of the trans-Pacific cable is $10,000,000.

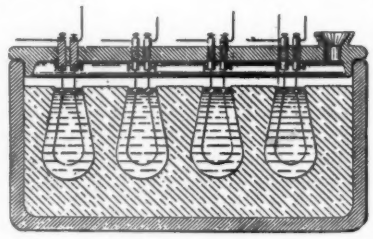
The contest among New York telegraphers, which will probably take place in Hardman Hall, Fifth avenue and Nineteenth street, on the afternoon and evening of Saturday, March 11, excites deep interest, and, it is said, will prove the most satisfactory and decisive tournament of the kind which has taken place on this continent. The entries, which will include a ladies' class, will be open to all comers. The decisive test, it is expected, will develop the extreme capacity of an absolutely "clear" conductor or wire manipulated by the fastest senders and most expert receivers in this country and Canada. All the matter transmitted will be copied, so that perfection in the formation of the Morse signals must go hand in hand with high speed. Operators receiving such matter will be permitted to use either pen, stylus or typewriting machine. In the test with Walter P. Phillips' code it is expected that results will be shown which will place the American telegrapher at the head of his craft throughout the world.

A New Method of Making Incandescent Lamp Filaments.

In a recent issue of the *Zeitschrift für Electrotechnik* is described the following method for making incandescent lamp filaments as practiced by the Actien Gesellschaft für Elektrische Glühlampen, at Budapest. The filament is constructed in three layers, of which the core is the actual carbon thread. It is soaked with a mineral gum, and is covered with a non-conducting sheath of silicate which melts during the carbonization and serves not only to protect the filament from burning during the process and from the air, but also to give it a smooth surface on which the third layer (which is necessary to adjust the resistance) can be finely and evenly deposited.

Hitherto the resistance of the filament has been adjusted after fixing in the bulb; but in the present case the thread is completed before being placed in position. It is usual to adjust the resistance by heating in a liquid or gas from which carbon can be deposited; but the currents set up by the heating hinder the process, owing to the contained oxygen acting on the depositing carbon, and spoiling its quality. The filaments are, therefore, heated in this process in a bath of paraffine or naphthalin, or some similar hydrocarbon, solid at ordinary temperatures. Since only the particles in the immediate neighborhood of the filament become liquid, no appreciable convection currents are set up.

The construction of the bath may be seen from the annexed figure. The complete process is as follows: The wooden, silk or cotton thread is steeped in a solution of water glass, 25 to 30 per cent.; senegal gum, 10 to 15 per cent.; caustic soda, 12 to 13 per cent.



A New Method of Making Incandescent Lamp Filaments.

It is then rolled, being bent into the form of an angle iron, this form having the advantage of possessing many sharp edges, which, says the *Zeitschrift*, are known to be more luminous than surfaces. The filament is then carbonized in the usual manner, and replaced in the paraffine bath, the paraffine solidifying round it; the necessary arrangements for measuring their resistance are made; the current is passed, and particles of carbon are deposited on the silicate sheath. When the filament attains the proper resistance the current is cut off, the bath of paraffine is melted, and the filament removed; the particles of paraffine are cleared off by alcohol, and the filament is then ready to be fixed in the lamp.

The method is said to possess the following advantages: The gum gives the filament great toughness and strength. The silicate sheath again strengthens it and forms an evenly constructed whole. The adjustment of the resistance is much easier, as paraffine is the most suitable hydro-carbon for the purpose of depositing carbon, while the solid bath prevents all access of air during the process.

The new telephone company, which has been in process of formation for several months by a number of Baltimoreans, has been incorporated in West Virginia under the name of the People's Telephone Company. The incorporators are J. H. C. Watts, Lawrence B. McCabe, William Wilfson, George R. Carter, Charles H. Ware and B. H. Warthen. J. H. C. Watts has been elected president, and Charles H. Ware, secretary and treasurer. The office of the company is in charge of B. H. Warthen, formerly auditor of the Chesapeake and Potomac Telephone Company. Mr. Warthen says that the new company has already procured about 1,000 subscribers.

How to Make a One Horse-Power Motor or Dynamo.

An excellent little hand-book has been prepared by A. E. Watson, containing full instructions how to make a one horse-power electric motor or generator. The work is prepared with a view to enabling amateurs to construct a machine of the character referred to in the title. The instructions are particularly clear and plain, and have been made with a special view to enabling a machine to be constructed with limited tool facilities. A lathe can do all the work required by the instructions. The use of a planer has been completely avoided. A milling machine will be found convenient, but it is not essential. The construction described is formed of a field magnet casting in but one piece, even the arms for supporting the bearings being integral with it. The machine described is of a type found efficient and serviceable for practical use, and is of one horse-power capacity, capable of pumping water, blowing a large organ, running a small machine shop or printing office, or driving a 16-foot boat five or six miles per hour. As a dynamo it will run one 2,000 candle-power or two 1,200 candle-power arc lamps, or ten 16 candle-power incandescent lamps, or a plating establishment of moderate capacity. The book will be found of great service to mechanics or others who desire to construct and use a small machine. The castings and extras for the motor can, if desired, be purchased at rates quoted in the book. The instructions are so plain that it would seem to be impossible for any mechanic of ordinary intelligence to fail in producing an excellent machine if they are faithfully followed. The motor is designed to be operated on circuits of a voltage which is available wherever incandescent lighting is used. The book can be supplied by the Electrical Review, 13 Park Row, New York, for only 25 cents, and is, therefore, within the reach of all.

LITERARY.

"Journal of the United States Artillery" for October, 1892, has come to hand.

"Transactions of the American Institute of Electrical Engineers for November, 1892," have been received.

"Index to the Journal of the Institution of Electrical Engineers," vols. XI-XX, 1882-1891, has been received.

The Philadelphia *Record* Almanac for 1893 has been received. A great deal of information is squeezed into a very small space in this book.

We have received from Mr. Wm. E. Clarke, city clerk of Providence, R. I., the "Report of the Joint Special Committee to report the terms and form of a new contract for 1,300 electric arc lights" for the city of Providence.

The Messrs. Macmillan & Co. have in preparation for immediate issue a collected edition of the poems of William Watson, including his recently published *Lachryma Musarum*. A limited edition will also be printed upon Dickinson & Co.'s English hand-made paper.

A Deaf and Dumb Telegrapher.

"The most remarkable man whom I have ever come across was a telegraph operator whom I knew in Sedalia, Mo.," said A. J. Cole, of St. Louis, to a reporter. "He was remarkable from the fact that he was deaf and dumb, and yet I have heard people who were well acquainted with his work say he had hardly his equal for accuracy or speed. This must have been a fact, too, for he was accustomed to deal with the press dispatches, work which requires more than ordinary ability. I believe he deciphered the messages he received by reading the movements of the relay armature, and you can understand what class of eye is required to accomplish such a feat. The most peculiar thing about the man's position was that he had been born deaf and dumb. I have known of only one other operator who was deaf. His plan of receiving dispatches was this: He would put his head against the instrument at which he was working, so that he could feel the jarring of the sounder. This was his only method of translating the dispatches received. His 'copy' was absolutely free from the most common errors."

Interference of Electrical Waves in a Metallic Circuit Illustrated by the Telephone.

BY M. R. COLSON.

At a recent meeting of the Academie des Sciences, Paris, M. Colson brought to the attention of that body a new method which enables him to demonstrate the existence of interferences of electrical waves in closed circuits.

His apparatus consists of a Ruhmkorff coil which makes 130 complete vibrations per second; and is energized from a thermo-electric battery. A copper wire is attached to one of the terminals of the secondary coil (the inductorium); this conductor ends in a spring or fastener from which extends what the author styles a "medium conductor," *i. e.*, a conductor of low conductivity, such, for instance, as a linen thread impregnated with a solution of calcium chloride. The end of this thread remains insulated.

Upon touching the end of this thread with a flexible conductor, including a telephone, the other terminal of which is also insulated, it is found that, although at first there is quite a perceptible noise in the telephone, by moving the conductor along the thread there will be noticed a point where the telephone remains silent. This portion of the thread M. Colson calls the "length of extinction." Again using the above described arrangement of circuits, it is found that the space over which we must move the conductor before silence ensues in the telephone increases when we connect the second terminal of the instrument and inductorium with a series of increasing electrical capacities, and we may regulate these so as to make them correspond to a given length of thread.

For instance, both terminals being insulated and using a linen thread 0.3 mm. diameter, impregnated with calcium chloride, the length of thread we shall have to move our conductor before the noise in the telephone is extinct amounts to 1,20 mm.

If we connect the terminals of the secondary coil with the ends of the linen thread (three meters), it is found that there is a certain portion of the thread, measured from each end, where the telephone produces no sound, and the same phenomena will be observed which we noticed upon the open circuit arrangement. By gradually shortening the thread until both "lengths of extinction" are equal, we produce a neutral zone along which the telephone remains silent. A further diminution of this length decreases the extent of the neutral zone which is gradually displaced towards the end of the thread. Finally, when the two terminals of the conductor touch, the neutral zone spreads over the entire circuit and the telephone remains silent, even if we apply it to the terminals of the secondary coil.

Two threads of equal length may be substituted, each one connected by one of its terminals to the secondary coil while the remaining terminal is insulated. A copper rod, or wire, riding upon the two threads may serve as the movable conductor. Now, using our above described mode of connection, we find that a neutral zone exists upon but one of the threads. Again, leaving the bridge contact with one of the threads undisturbed, but displacing the other contact, we are able to make the rider itself the neutral zone. Instead of an induction coil, we may also employ an electrical tuning fork. In this case the telephone responds to a variation of charge; consequently the intensity of the sound now depends upon the variations of the potential of the conductor at the contact point, and the silence of the telephone indicates here a zone of least variation or a minimum of potential. As this neutral zone exists only in a closed circuit, it is evident that the point of least potential is really an interference phenomenon between two electrical waves of equal period moving in opposition and meeting at that point.

Another possible explanation is this: The waves radiating from one terminal of the inductorium are alternately positive and negative; consequently the potential of the two must be least when they are equal but of opposite sense, and this supposition may be verified experimentally because the telephone is silent whenever in a closed circuit contact is made with a good conductor. In this case the length of the waves is very great, probably several million kilometers, especially with such a low frequency.

Summarizing, we see that a neutral zone exists at the intersecting point of two waves of equal length, the waves moving in opposite directions.

The spreading of the neutral zone upon a single thread in proportion to the receding of the contact from the terminal point shows that on account of absorption the curve which at any given moment would represent the potential gradually becomes flattened.

With each conductor of decreasing conduct, the wave becomes larger and the neutral zone wider.

The author concludes by pointing out that the telephone becomes thus an instrument which enables us to ascertain wave interference and the influence of absorption, as well as the length of waves. The method employed is quite simple, but of extreme sensitiveness and precision.

[It occurs to us to ask whether the telephone has ever been used in the investigation of magnetic waves on the Hertzian plan? It would seem that a telephone would sound at the points where the sparks are now observed.

Again, may it not be reasonable to ask whether the absence of current in the Wheatstone bridge, or the absence of sound in a telephone placed in the bridge wire, may not be shown to be due to such interference of two waves of equal length, but moving in opposite directions?—EDS.]

Lighting Factories by Electricity.

In considering the problem of lighting a manufacturing establishment by electricity, it is often found that the engine already installed to furnish power to the operating machinery has a surplus, which it may be desired to use for driving the electric light dynamos. On general principles, however, it is always the better plan to have a separate engine or engines for this work. Sometimes, it is true, the factory owner having such power surplus in his main engine does not wish to incur the expense of a new additional engine, or there may be difficulties in the way of securing room for an extra engine. Under such circumstances, of course, there remains nothing else to be done but to take the necessary power from the engine already in use, and the difficulties of operation then to be encountered are found in the fact that the often unavoidable speed variations in the engine, due to heavier or lighter loads, according to the amount of work being done in the factory, will unfavorably affect the light. Besides this, the light will, of course, be cut off as soon as the factory engine stops, and illumination of the shops will be impossible after the regular working hours unless it is proposed to run the large engine for the lights alone, a proceeding which may be rather expensive.

These difficulties, it has been pointed out, may be avoided by the addition of an electric storage battery plant which will serve as an electric reservoir, reducing current variations, and storing up electric energy at times of surplus, to be given out again at other times when the demand for light may be at its maximum. A comparatively small surplus engine power may, in this way, sometimes prove sufficient to do a considerable amount of electric lighting and save the cost of enlarging the engine plant.

A sample installation of this kind was described some time ago in one of the foreign electrical journals, *Der Elektrotechniker*, and a few of the particulars there given may be of interest. In this case the shops and offices of a factory and some annexed dwelling rooms were to be lighted, and it was desired to have light available in the offices and dwelling rooms for some time after the factory engine was usually shut down. The shops, accordingly, were furnished with 100 volt lamps, and the other quarters with 70 volt lamps. The dynamo furnished, normally, a 110 volt current, so that, with an electromotive force of 2½ volts for each storage battery element, the dynamo had a charging capacity for 44 elements.

Fig. 1

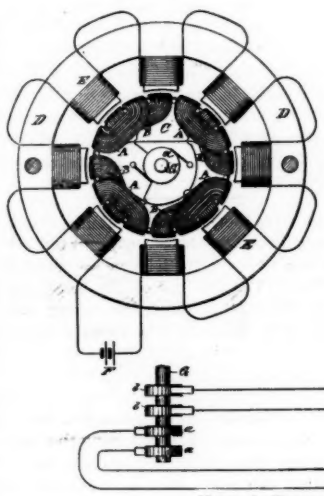
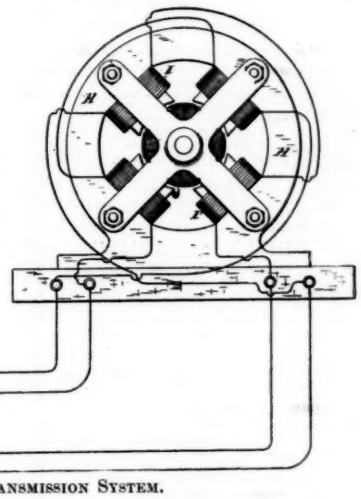


Fig. 2



TESLA'S POWER TRANSMISSION SYSTEM.

A 44 cell battery was, therefore, coupled up with the dynamo, a circuit breaker being interposed in the circuit to prevent discharge of the battery through the dynamo in case the speed of the latter, for any reason, should fall off. Three mains were led off from the battery. The first wire was connected with the positive pole of the second cell, and served both the 100 volt and the 70 volt circuits. The second wire was connected with the negative pole of the forty-third cell and supplied current for the 100 lamps. The third wire, finally, was connected with the negative pole of the thirty-first cell and supplied current to the 70 volt lamps. With this arrangement there were, as will be seen, two groups, one of 42 cells and one of 30 cells. The first group furnished a current of $42 \times 2.5 = 105$ volts, and the second, a current of $30 \times 2.5 = 75$ volts. The first and last cells were not included in the supply circuits. The arrangement admitted of three combinations: 1. With the lamps out of circuit, the storage battery is charged during the day; 2. Both the 100 volt and the 70 volt lamps are supplied with current by the dynamo and the storage battery together; 3. The 70 volt lamps are fed by the storage battery alone.

It is to be borne in mind that in an arrangement of this kind, the storage battery's capacity must be sufficient for the number of lamps to be supplied, and must also be designed to receive the whole of the dynamo current as charging current.

The Sunset Telephone Company has recently repaired its line between Marysville and Sacramento, Cal.

Transmission of Power by Alternating Currents.

A patent recently issued to Nikola Tesla describes a system of transmission of power for which Mr. Tesla filed an application in 1888, in which the number of poles in the motor are less than the number of poles in the generator, thus permitting the motor to be operated at low speed, although the generator may be developing impulses of comparatively high frequency. Mr. Tesla's apparatus is illustrated in the accompanying engraving, wherein is shown, in Fig. 1, a diagram of a generator having a constant field magnet circuit and provided with an armature having two sets of coils adapted to deliver quarter-phase currents into an external circuit. The generator is shown as provided with eight poles, and in Fig. 2 is shown a motor which may be operated by being connected to the four leads running from the generator. The motor having four poles and the generator eight poles, the motor will run at half the speed of the generator.

The Wire Gauge Muddle.

A contemporary, in discussing the proposition to adopt a new wire gauge, or to designate sizes of wire in decimals of an inch, seems to conclude that there is some special value in having a regular, or "logical" arrangement of sizes, *i. e.*, that the increase of sizes should be represented by a straight inclined line, or by some regular curve, says the *American Machinist*. We fail to perceive why this should be so, and so far as we can see there is no use whatever in adopting any new gauge in order to designate sizes in decimal parts of an inch. The demand of wire and sheet metal users is not that curves representing the increase of sizes from one number to the other shall be regular or beautiful to the eye, but that sizes which are actually needed in practical operations shall be available, and that, when a certain size or number is mentioned or ordered, that size or number shall mean precisely the same thing to all concerned.

In order to do this, it is not at all necessary, as far as we can see, that a new gauge should be devised, but only that some well-known gauge now in use which gives the required range of sizes, or some combination of gauges which will give the desired range, be adopted, and the actual sizes corresponding to its numbers definitely determined and used in ordering, or in any way referring to the wire or sheet metal. And, so far as we can see, there is no virtue whatever in any particular "number," as distinguished from the designation of its equivalent size in decimals of an inch. For instance, if wire one-half inch diameter is talked about, it is just as easy to call it number 500 (thousandths being understood) as it is to call it by any arbitrary number which may or may not indicate to those who happen to be acquainted with such matters just what the size really is. Three-eighths wire would then be number 375, $\frac{5}{16}$ inch wire would be number 312½, $\frac{15}{64}$ inch wire, if there were such a size, would be number 234⅜, and so on, the number always indicating directly and absolutely the actual diameter of the wire or the thicknesses of the sheet in thousandths of an inch, which mean precisely the same thing in every shop and in every country.

Users of wire and of sheet metals, acting in conjunction with the manufacturers of these articles, have adapted the supply to the demand and the demand to the supply, in the matter of sizes or gauge numbers. So far as we can see there is no need whatever to disturb this adjustment in order to avoid confusion, but only by common consent to designate sizes in decimal parts of an inch, instead of by arbitrary numbers. If every man who orders wire or sheet metal will simply determine the diameter of the wire or the thickness of the metal he wants, and then so designate it in his order, with the limit of variation allowable, the problem of the wire and sheet-metal gauge will, we think, be in a fair way of solution, and the committee of the American Society of Mechanical Engineers, who is to consider and report upon the matter, will do well to avoid the attempt to devise a new gauge. There are enough gauges—too many.

ELECTRICAL REVIEW

Published at 13 Park Row,
P. O. Box 3329. NEW YORK.

EDITOR:
CHARLES W. PRICE.

ASSOCIATE EDITORS:
STEPHEN L. COLES.
ROBERT H. READ.

REGISTERED CABLE ADDRESS:
"ELECTVIEW," NEW YORK.

"1546 CORTLANDT." TELEPHONE CALL.

BOSTON OFFICE:
H. G. TUCKERMAN, Room 29, 620 Atlantic Ave.

WASHINGTON OFFICE:
GEO. C. MAYNARD, 1409 New York Ave.

CHICAGO OFFICE:
MERWIN J. BULKLEY, 435 "The Rookery."

ADVERTISING DEPARTMENT,
H. T. RICHARDS, Manager.

PATENT BUREAU,
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One Year, United States and Canada, - $3.00
One Year, Foreign Countries, - - 5.00
Single Copy. - - - - - - - .10

NEW YORK, JAN. 21, 1893.

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The expressive word "unique" is entitled to a day off. Every metropolitan journal that comes to our desk used it editorially last week in speaking of the life and death of General Butler.

The ELECTRICAL REVIEW will be glad to correspond with any one who has volumes 7 and 11 of the proceedings of the National Telephone Exchange Association with which they are willing to part.

We trust every interested reader of the REVIEW will make a note of the date of the next convention of the National Electric Light Association at St. Louis. It will be held February 28 and March 1 and 2.

We are informed that a recent mention in the ELECTRICAL REVIEW of an interesting little pamphlet brought forth many inquiries for it, one request coming from the interior of India. Thus it is again proved that "good words travel far."

The recent severe snow storms in New York city and Brooklyn afforded an excellent opportunity to judge the superiority of the trolley cars over horse cars, even when four horses were used to haul the latter. The Union Railway Company furnished an almost uninterrupted service to its patrons, and the Brooklyn roads were equally successful.

Storage battery traction matters appear to be looking up, and it may be that considerable development in this direction will be apparent before long. At least one company is experimenting with storage battery cars in New York city, and we hope that the report is correct that a storage battery road will be in operation in this city before many months elapse. There are many localities in New York where such a system is eminently proper and practicable.

The financial editor of the New York *Independent*, after an examination of the average first cost, running expenses and receipts of 22 trolley, 45 horse and 10 cable railways, finds that the advantage in cheapness in favor of the trolley is great enough to allow a horse railroad, which is just paying expenses, to be converted into a trolley and earn $350 more a mile annually in clear profit above the expenses of changing. The advantages and profits of an increased passenger traffic form an important item of consideration, and one which experience has shown may be safely counted upon.

Benjamin Franklin's one hundred and eighty-seventh birthday anniversary occurred on January 17, this great American having been born in Boston, January 17, 1706. So far as we are informed, no celebration of the event was observed by any electrical society. This is not as it should be. Franklin's electrical researches ought certainly to entitle him to remembrance in a public manner at least once a year. We have electrical societies enough to do him honor, and they should do it. Franklin was a typical American, and the effect of his services to these United States is still in force. This is another reason why we should remember him. Do not let another anniversary of his birth pass by without some fitting recognition of his worth as a scientist and an American.

The bill authorizing city councils to grant street railroad franchises for 99 years is to be a leading event in the general assembly of Ohio. The bill passed the senate last winter and went to the house, where, after a desperate battle, it was referred to the committee on railroads instead of municipal corporations. The press of the State is substantially a unit against the bill in its present shape, but opposed to the press is a powerful combination. The bill as drawn provides that when a city council and car corporation can agree upon a payment by the latter of a "certain percentage of the gross receipts into the city treasury," the council shall grant the franchise. The press objection to the bill is that the car corporation can afford to wait until it gets a subservient council, when a low percentage would be agreed upon binding the city for 99 years.

A NEW WINDING FOR ELECTRO-MAGNETS.

Mr. Varley's improvement in winding electro-magnets, described on another page, will prove interesting to those who use magnet wire in large quantities. The plan consists in winding as a duplex wire a covered and bare wire, resulting in a saving of half the difference in price between covered and naked wire on all wire used. In addition to this, a stronger magnet is produced with the same length of wire, because of the increased number of turns resulting from spare room given by the naked wire. The magnets are wound more rapidly than a single wire, having the same number of turns, the ends being connected as desired for series or parallel coupling at the finish. This plan is primarily an outgrowth of an effort to cheapen and improve the manufacture of bells, for which the inventor has contributed a number of interesting inventions, heretofore described in the ELECTRICAL REVIEW, among which are a dust protector to insure ringing and a back-stop pinched in a soft rubber plug to prevent change of adjustment by vibration of the hammer. The duplex wire may be applied to all apparatus using moderate voltages, and will find a broad field of application.

LETTERS FROM A LABORATORY.—XXX.

BY JULIAN A. MOSES.

It does not generally happen that the light in a laboratory is of the best, and artificial means of illumination must be resorted to in order to obtain good photographs. Very nearly all of the photographers of the present day use burning powdered magnesium as the source of their artificial light, and it must be said that this is the cheapest material for the purpose where intermittent work is being done, but where a person is employed in an occupation such that a steady illumination of objects is a necessity, the magnesium flash-light must give place to the arc light. The illumination with these two sources of light is in some respects different. With magnesium the shadows are clear, sharp and distinct; but it seems that this light, so rich in actinic rays, is such that by its use the details do not come out in the photograph as well as should be desired. Masses of light are predominant and photographs of machinery, etc., illuminated by flash light are imperfect in the details and not at all satisfactory. This fault may in a measure be avoided by the use of large white screens, placed in such positions that the light may be more diffused, and thus be made to cast more moderate shadows. Magnesium lamps have been constructed which burn the magnesium in ribbon form. By this means the center of illumination is thus kept at one point, the rays being diffused by a reflector placed back of the light. Illumination by magnesium is to be recommended where there is no arc light circuit available; but where such a circuit is at hand, it may be utilized to advantage.

Slow exposures are preferable with the arc light illumination. More satisfactory results are obtained by using what are known as "process" plates, which give, with proper development, perfectly black and white negatives.

In the photographing of drawings, cuts, etc., a proper arrangement of the subject, relative to the camera, is essential. Some photographers prefer to suspend their apparatus by means of springs in a manner similar to that used in hanging galvanometers, but this is only necessary where there is considerable vibration to the building. When arc lamps are used they should be placed one on each side of the drawing, so that it will be equally illuminated; remove all traces of ink spots and unnecessary markings of all kinds, as they will be more difficult to remove on the drawing before the exposure than on the negative afterwards. A little care in the beginning will save a great deal of trouble in the end, for very unsatisfactory results are obtained where retouching must be resorted to.

It sometimes happen that there may be some spot on the drawing that requires a little more light than any other part; this may be rare, but it has happened many times in my laboratory, and it is well to be forearmed, so that when the occasion does arrive, a faulty negative will not necessarily be the result.

Cut off in a lathe about two inches of a piece of brass tubing having a diameter of about one inch. Surround the arc lamp with a cylinder of pasteboard, white on the inside, and on a level with the points of the carbons cut a circular hole, into which the tube must be pushed. Fit into one end of the tube a strong cork in which is bored a hole about three-eighths of an inch in diameter. Into this hole must be inserted a glass rod of the same diameter, which is cut perfectly plane on both ends. The rod may be of any length, or it may be twisted in any shape, for, according to the principle of total reflection, no matter what the shape of the rod may be, nearly all of the light that enters it will be reflected and emitted at the end, provided the ends are polished plane and are at right angles with the axis of the rod. In cases where it is desired to obtain larger areas of light, ends of different size and shape may be put on the extremity of the rod farthest from the source of light. These ends should be conical and of solid glass, so that the rod and end would resemble somewhat the neck and spout of a watering pot. In order to obtain a rod that will be flexible and transmit rays of light, it is necessary to have two plane-end glass rods joined by a flexible rubber tube, which must be previously carefully filled with water, so that no trace of air bubbles can be detected. By this apparatus any particular spot of the drawing or subject to be photographed may be specially illuminated, or the room may be darkened and any particular parts of the machine or apparatus may be photographed.

Lenses may be placed in front of the end of the rod, so that the issuing light may be diverged or brought to a focus, thus changing the size of the field of illumination at pleasure.

CORRESPONDENCE.

OUR BOSTON LETTER.

A Special Town Meeting was held at Braintree, Mass., last week, at which it was decided to expend $16,650 in enlarging the electric light plant of the town.

The Somerville Electric Light Company are contemplating the still further enlargement of their plant, it being found absolutely necessary in order to meet the steadily increasing demands. The company are now lighting the towns of Somerville, Belmont and Arlington.

Swan & Lane, electrical engineers of this city, are fitting up the new theatre at Taunton, Mass., with an incandescent plant of 700 lights. Current is supplied by the Westinghouse alternating system from the station of the Taunton Electric Light Company, about a mile and a half distant.

The **Lynn and Boston Street Railway Company** have petitioned the selectmen of Beverly for permission to extend their lines to that town, and a public meeting will be held on the evening of January 31, to afford the people an opportunity of expressing their views on the subject. There is little doubt as to the result of the vote, as popular opinion is strongly in favor of the scheme.

The **Edison Illuminating Company,** of this city, are preparing to meet the demand for electric light and power among the large factories and storehouses in the comparatively new section of the city, known as South Boston, and are building a mammoth station on Liverpool wharf. From here, three cables 1,180 feet long and weighing four tons each, will be laid across the harbor and current supplied thereby to the entire district.

The **Incorporation** of the Central Massachusetts Street Railway Company, at Worcester, Mass., is the first step in a gigantic enterprise which will make that city the center of the largest single suburban system in the world.

The promotors of the new company, among whom are the officers and heaviest stockholders in the Worcester, Leicester and Spencer, the Worcester and Southbridge, and the Worcester and Millbury lines, are after franchises for nearly 50 miles of new territory, embracing two cities and 12 towns, which, in addition to that already covered by the above mentioned companies, all of which will be combined under one management, will give them a total mileage of from 75 to 80 miles and furnish electric traction to 26 of the most important cities and towns in the central portion of the State.

It will require a capital of at least $800,000 to build the new lines, and to equip them with the necessary power stations, machinery and rolling stock will bring the aggregate cost up to something over $1,000,000.

Hon. Samuel Winslow, president of the Worcester, Leicester and Spencer and Worcester and Millbury lines, has already subscribed for $20,000 worth of the new stock, and the balance is being taken up by the parties interested in the above lines and some of the principal business men of that section.

The enterprise is bound to be a success, as the need of something of the kind has been long felt, the communication between many of the towns being limited to a carriage or semi-annual stage coach and between others to a circuitous railroad route with bad connections. For instance, Northboro, which is only nine miles from Worcester, and in Worcester county, can be reached by rail only by going to Clinton, a distance of 17 miles, and from there to Northboro, 10 miles further, a trip of 27 miles to cover a distance of 9.

Naturally, the people want electric roads and will support them in every possible way, and there is no lack of either capital or enterprise to put the matter through. Work will be commenced at once and the entire system will probably be in operation before another winter.

Here is a chance for our electrical engineers, construction and supply men to get in line. Let the good work go on.

Boston, January 14. H. G. T.

OUR CHICAGO LETTER.

George Cutter's latest is a mining socket which is said to be water-proof.

H. T. Paiste, of Philadelphia, was in the city last week booking some nice orders for his factory.

S. S. Wheeler, of the Crocker-Wheeler Motor Company, spent a week here recently closing several large deals.

Wm. D. Kurz, manager of the K. A. P. Electric Novelty Company, La Crosse, Wis., was in the city on business last week.

The Delegation Appointed by the Chicago Woman's Club to present resolutions to Congress, urging that the World's Fair be kept open Sunday, left for Washington on Monday of this week.

Mr. Leo Daft, the well-known electrical engineer, was in the city last week and made a contract with the Railway Equipment Company for total overhead construction for a new road which he is building at Everett, Wash.

The Chicago Electrical Association at its last meeting elected the following officers for the ensuing year: President, Albert Scheible; vice-president, F. S. Hickok; secretary, M. B. Speir; treasurer, L. G. Bassett; librarian, C. A. Pratt; auditor, H. G. Dimick.

Mr. Gates, of the Siemens & Halske Company, reports having closed a contract with the Buffalo Bill Wild West Combination for twenty 10,000 candle-power search-lights, also 60 arc and 500 incandescent lamps for the purpose of illuminating their exhibition, which will be located at Sixty-third street and Woodlawn avenue during the World's Fair.

The International Register Company held their annual meeting Wednesday this week. It is said that the annual report of Manager Englund was extremely gratifying to the stockholders. The company commenced the new year with exceptionally bright prospects. Their registers are making new friends daily. The old officers were re-elected for the ensuing year.

Judge Ewing, on Tuesday, this week, heard the bill for an injunction brought by the Babcock & Wilcox Company, of New Jersey, against the World's Fair Columbian Exposition, to restrain the defendant corporation from permitting the Sterling Boiler Company to put in a part of the steam plant at the Exposition grounds. The defendant's demurrer was overruled, and it was ruled to answer in 20 days.

After Much Competition, which has waxed warmly during the past two months, the Detroit Electrical Works, through their Western representative, L. E. Meyers, have succeeded in capturing an additional order from the Calumet Electric Railway, this city, for ten 100 kilowatt generators, fourteen 40 horse-power equipments, and an expensive marble switchboard, together with other plant apparatus for their new power-house at Ninety-fifth street. Mr. Meyer reports an additional order for six 40 horse-power equipments from the Bell City Railroad, of Racine, Wis.

The Secretary of State on Tuesday, this week, issued a license to incorporate the Englewood and Chicago Electric Street Railway Company, at Chicago, with a capital stock of $1,000,000. It is proposed to build a railroad upon, over, along and across any and all of the streets of the city of Chicago to the boundary line between the States of Indiana and Illinois, and to such other places in Cook county as the company may determine. The incorporators are James P. Mollette, Davitt D. Chidester, George C. Lozier, William H. Comstock and F. W. Pringle, all of Chicago. M. J. B.

Chicago, January 14.

Canadian Electrical Association.

As already announced in the ELECTRICAL REVIEW, the next convention of the Canadian Electrical Association will be held at the School of Practical Science, in Toronto, Ont., on Wednesday and Thursday, January 25 and 26, 1893.

The order of business, as at present arranged, is as follows:

Wednesday, January 25.—2 P. M. President's address; secretary-treasurer's report; reports of committees; paper by Mr. George Black, of Hamilton, on "Electrical Measurements;" paper by Mr. W. A. Tower, Toronto, on "Underground Construction;" an invitation is extended to the members of the Association to visit and inspect the Toronto Electric Light Company's new station; 8 P. M. Dinner at McConkey's.

Thursday, January 26.—10 A. M. Discussion on proposed amendments to the constitution; paper by Mr. J. M. Campbell, of Kingston, on "Free Wiring;" paper by Mr. R. G. Black, of Hamilton, on "The Incandescent Lamp;" paper by Professor Rosebrugh, School of Practical Science, Toronto, on "Speed Control;" paper by Mr. Breithaupt, of Berlin, Ont., on "Probabilities as to the Success of Distribution of Power at Considerable Distances by High Tension Currents of Electricity."

The officers of the Canadian Electrical Association are as follows:

President, J. J. Wright, manager Toronto Electric Light Company; first vice-president, K. J. Dunstan, local manager Bell Telephone Company, Toronto; second vice-president, John Carroll, secretary-treasurer Eugene Phillips Electrical Works, Montreal; secretary-treasurer, C. H. Mortimer, publisher *Electrical News*, Toronto; executive committee: D. A. Starr, Royal Electric Co., Montreal; H. O. Fisk, electrician Electric Light Co., Peterboro', Ont.; W. A. Johnson, manager Ball Electric Light Co., Toronto; S. J. Parker, managing director Owen Sound Electric Light Co., Owen Sound, Ont.; A. B. Smith, inspector Canadian Board Fire Underwriters, Toronto; D. Thomson, general manager Hamilton Electric Light and Power Co., Hamilton, Ont.; Thos. H. Wadland, superintendant construction, Bell Telephone Co., Hamilton, Ont.; L. B. McFarlane, Bell Telephone Co., Montreal; John Yule, manager Guelph Gas and Electric Light Co., Guelph, Ont.

The offices of the Association during the convention will be at No. 40 York street, near the Union station. Members are requested to call at this address immediately on their arrival in the city.

The School of Practical Science is situated on the University grounds, Queen's Park, and may best be reached by taking a McCaul and College street car at the corner of York and King streets, and leaving the car on its arrival at College street.

The Bell Telephone Company has invited the delegates to visit the new Toronto exchange.

Regulating Socket for Incandescent Lamps.

The readers of the ELECTRICAL REVIEW are familiar with the Ries regulating socket for incandescent lamps designed for use on alternating current circuits. This interesting device, comprising a regulable choke coil mounted in the lamp socket, enables the supply of current to the filament to be regulated by a switch, so that the lamp may be burned at several different degrees of luminosity with a proportional consumption of current. It has heretofore been fully described and illustrated in this journal and is referred to now in connection with two fundamental patents which have lately, December 27, 1892, been issued, which contain a number of generic claims, among which are the following:

A regulating socket for incandescent electric lamps, etc., provided with a self-inductive conductor within the socket, in the filament circuit, and means for varying the degree of self-induction of said conductor.

A regulating socket for incandescent electric lamps, etc., provided with a counter electromotive force coil or reaction device, within the socket and in the filament circuit and means for varying the counter electromotive force generated by the said coil or device.

A regulating apparatus for alternating current incandescent lamps and other translating devices, the same comprising a socket or holder for the translating device, a magnetizable core housed within the socket and having a winding arranged to be connected across the terminals of the supply and translating circuits, a series of contacts to which intermediate portions of the winding are connected, and a switch arranged and adapted to vary the length of the winding included in the supply and translating circuits, respectively, substantially as set forth.

A socket for incandescent electric lamps containing a closed iron ring or core wound with insulated wire arranged and adapted to be included in series with the lamp, and a switch for opening the lamp circuit and for closing it through said winding, substantially as described.

PERSONAL.

Mr. A. J. DeCamp, the Philadelphia electric light magnate, paid the REVIEW a pleasant call last week.

Mr. H. P. Bradford, of Little Rock, Ark., succeeds Mr. H. M. Littell as general manager of the Mount Auburn Inclined Plane and Street Railway Company, of Cincinnati.

Mr. M. E. Baird, general agent, and H. S. Rodgers, of the electrical staff of the Eddy Electric Manufacturing Company, of Windsor, Conn., were New York visitors last week. Their progressive company is crowded with business, and has recently occupied a large addition to their factory, which the rush of orders for generators and motors compelled them to build.

Medical Electricity.

AN ELECTRICAL ENGINEER TAKES ISSUE WITH DR. BLEYER.

TO THE EDITOR OF ELECTRICAL REVIEW:

In an article by Dr. Bleyer, on the subject of measuring the resistance of the human body, he says that if the resistance of the human body varies from 500 to 100,000 ohms, as is believed to be the case by some, that "the man would simply be burned up." In another part of the same article he says he "finds a difference in the resistance, measured with every change in the electromotive force." I beg to ask the worthy Doctor with what system he makes his measurements for resistance?

If he uses similar instruments and battery to those used by electricians in their measurements for resistance, and there are several of such, I beg to differ with him. There is absolutely no danger of "burning his man up," and neither can a difference in the electromotive force of the battery give a different result. With a Wheatstone bridge set, for instance, and ten cells of bluestone battery, having a total of only 10 volts, he can measure up to 100,000 ohms resistance. There is certainly no danger of burning his man with ten amperes and at an electromotive force of 10 volts. But to measure the human body is most unsatisfactory, because no two persons or the same portion of any two persons will give the same result. This is due no doubt to the difference of tissue of the two persons. Some have a thick skin, some thin; some have by nature a dry and some a damp skin; some have large bones and some small ones. The condition of the flesh differs very much, some being hard and firm, while in others it is limp and soft. The state of the blood would naturally make a difference; in some there is considerable iron, etc., while in others there is a great deficiency. All these, together with the temperament of the individual, make it impossible to get reliable measurements, and this is supposing the contacts are made perfect.

Respectfully,

Brooklyn, Jan. 12. R. G. BROWN.

Special Train to the St. Louis Convention.

TO THE EDITOR OF ELECTRICAL REVIEW:

The various passenger associations have granted an excursion rate of a fare and a third to delegates attending the Convention of the National Electric Light Association, to be held in St. Louis, February 28, March 1 and 2, 1893. To secure this rate it will be absolutely necessary for persons purchasing tickets to state to the agent from whom the purchase is made, that they contemplate attending said meeting, and to procure from said agent a certificate which, immediately upon their arrival in St. Louis, should be left in the secretary's office, addressed to the undersigned, who will see that it is properly vised and returned to the owner.

Arrangements are now being made for a special train from New York to St. Louis, which will exceed in the way of equipment and appointments anything that has ever been in service between these two points. To bring this matter to a successful issue, it is very important that the number of passengers who wish to avail themselves of this train should be known at the earliest possible moment. Therefore, it is very desirable, and will facilitate transportation matters greatly, if all delegates who contemplate using this train will make application for space at once. C. O. BAKER, JR.,

Master of Transportation,

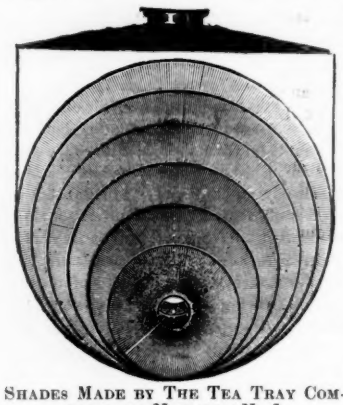
New York, Jan. 12. 136 Liberty st.

Bishop Gutta-Percha Company Elects Officers.

At a meeting of the stockholders of the Bishop Gutta-Percha Company, one of the old established electrical manufacturing houses, held at the office of the company, on January 11, Samuel Boardman, Helen E. Blitz and A. Spadone were elected directors for the ensuing year. The directors chose Samuel Boardman for president; Helen E. Blitz, vice-president, and Henry A. Reed, secretary and treasurer. The officers are the same as since the organization of the company, except that the treasurership is transferred from the president to the treasurer.

The Tea Tray Company.

There are a great many manufactured articles for the electrical industries which are in general use, but the manufacturers in many instances keep themselves in the background, and the credit for producing the goods is given to the concerns that handle them. Such a concern is the Tea Tray Company, of Newark, N. J. They have quite a monopoly in the goods that their firm name indicates, manufacturing trays of all sizes and descriptions, beautifully executed in design, color and finish. Besides furnishing



SHADES MADE BY THE TEA TRAY COMPANY, OF NEWARK, N. J.

the majority of the trays in use, this concern has been manufacturing a variety of shades and hoods for electrical purposes. A representative of the REVIEW recently visited their factories and was courteously received by Mr. A. S. Marten, who conducted him through the entire plant. What impressed the writer most was the fact that this concern was thoroughly equipped with expensive machinery with which to successfully turn out goods for their electrical trade. It was a fortunate combination when they undertook the manufacture of electrical goods, for the machinery used in the tray business, which has been established for many years, in most cases can be utilized in the manufacture of shades and hoods, so now it would seem that they offer the best facilities to the electrical trade. The officers of this company are Mr. A. S. Marten, president and treasurer; Mr. J. H. B. Conger, secretary, and Mr. Gideon Powell, director, with office and factories at 156 and 158 Summit street, Newark, N. J. Mr. Marten, besides being president and treasurer of the Tea Tray Company, is a successful merchant in this city. His interests here are in such shape that he can devote most of his time to his Newark property. Mr. Powell, of the firm of Powell Brothers, a well-known wholesale boot and shoe concern of Duane street, this city, as was before stated, serves in the capacity of director. We congratulate the electrical trade in having an opportunity to do business with Mr. Marten and his associates. The above cut represents six flat shades made by the Tea Tray Company, in sizes from 8 to 20 inches in diameter.

Prentiss Tool & Supply Company.

It is very gratifying, as we go around among the firms who are supplying their specialties to this great field of electrical development, to note the activity and good feeling which now exists. A firm who impresses us as being abreast of the times, and who are doing their part in keeping up with the procession, is the firm of Prentiss Tool & Supply Company, of this city. Mr. Prentiss is giving his personal attention to all the branches of the business of which he is the head, and the energy he displays testifies with a constant increase of business. This firm carries a full line of engine lathes, planers, friction shapers, crank shapers, screw machines, hand millers, bolt cutters, profiling and boring machines. This sort of machinery has great bearing on the electrical trade, and doubtless those who are interested along these lines at this particular time will see what the Prentiss Tool & Supply Company have to offer. A prominent feature of the business is the second-hand machinery they have on hand. Their address is 115 Liberty street, New York, and 59 South Canal street, Chicago, Ill.

Submarine Telegraph Enterprise.

Some points of interest may be noticed just now in connection with submarine telegraph property, says London *Industries*. The position of this property appears to be experiencing some change. Hitherto what we may term the international telegraph business of the world has been very largely in British hands, and London has been unmistakably its headquarters. The lines of the Anglo-American Telegraph Company, Limited; the Brazilian Submarine Telegraph Company, Limited; the Cuba Submarine Telegraph Company, Limited; the Direct Spanish Telegraph Company, Limited; the Direct United States Cable Company, Limited; the Eastern and South Africa Telegraph Company, Limited; the Eastern Extension, Australasia and China Telegraph Company, Limited; the Eastern Telegraph Company, Limited; the Indo-European Telegraph Company, Limited; the West African Telegraph Company, Limited; the West Coast of Africa Telegraph Company, Limited; the Western and Brazilian Telegraph Company, Limited, and the West India and Panama Telegraph Company, Limited, were all planned and established by British capitalists, and they have long held a practical monopoly of the submarine telegraph business of the world. There are now, however, indications of increasing competition in various quarters. The domain of the Anglo-American Telegraph Company has been invaded several times without success, but the latest invader—the Commercial Cable Company—appears to have come to stay; and not content with attacking the Anglo-American Telegraph Company, American capitalists have, within the last year or two, laid a cable from New York to Rio de Janeiro, thus, indirectly breaking into the district hitherto exclusively worked by the Brazilian Submarine Telegraph Company. American pride has something to do with the matter, as well as American enterprise. The United States have become such an important quarter of the world during the last 20 years, that American *amour propre* revolts at the idea of being in any way dependent upon England for the means of telegraphic communication. For a lengthened period, when a New York merchant required to communicate by telegraph with a correspondent at Rio de Janeiro, his message had to be sent first of all to London, and this did not suit American ideas at all. The result was the submersion of a new and independent cable from New York to the Brazils. Two other invasions are now threatened of what we may term British fields of telegraphic enterprise. The first of these invasions has been on hand for many years—nearly 10; but the aggressive movement appears to be now showing a little more life and vigor. We refer to the scheme for the submersion of a cable from some point on the Pacific Coast of the United States to the Sandwich Islands, and thence to New Zealand and Australia. If this cable is ever laid, it will, of course, compete, to some extent, for business with the lines of the Eastern Extension, Australasia and China Telegraph Company. The Americans have relieved themselves of British intervention in the matter of telegraphic communication with Brazil; but even now, when a New York capitalist or merchant wishes to communicate with Australia or New Zealand, his dispatch has to be sent *via* London, the cost being necessarily greatly increased. The promotors of what we may term the Pacific line of telegraph appear, in the first instance, to rely for support on the Australian colonies; but these colonies have not been in a particularly flourishing condition for several years past, so that their Governments were reluctant to enter into any fresh commitments. If a Pacific telegraph is ever laid, it will clearly have to be carried out, to a considerable extent, with American capital, and the Congress of the United States has so far assisted the movement as to make what the Americans term an "appropriation" for a survey of the bed of the Pacific between San Francisco and the Sandwich Islands. The matter has thus reached a further stage of advancement. Long conferences are still pending between the promoters of the scheme and the various Australian Governments for the purpose of obtaining subsidies from those administrations, and some time may yet elapse before the laying of the proposed cable is actually commenced; still the chance and prospect of such a cable being laid and established appears to have become more immediate than hitherto. The second important telegraphic enterprise now in hand is a scheme brought forward by Mr. Cecil Rhodes, the exceedingly energetic Premier of the Cape Colony. A considerable net work of telegraphs has been established throughout British South Africa by the Cape and Natal Governments, and an extension of the South African telegraphic system to Salisbury, a new township in Mashonaland, has recently been completed. The bold idea, which has been conceived by Mr. Rhodes, is the establishment of a land line of telegraph from the existing terminal point in Mashonaland direct to Cairo. This would be a kind of "Africa for the Africans" policy, but it is difficult to see how such a line could receive sufficient support at the hand of the African public to remunerate the capital which its establishment would absorb, more especially as there are existing means of submarine communication all along the east coast of Africa. The establishment of the line of telegraphs proposed by Mr. Rhodes would certainly increase the store of knowledge accumulated by Europeans with respect to the geography and general resources of Central Africa; but it is difficult to see that it would promote any other useful object, at any rate for the present.

One or two other incursions have been made in British submarine telegraph territory, but we do not deem it necessary to refer to these in detail. The question remains, What is the best course for British submarine telegraph companies to pursue under all the circumstances? It must be admitted that the promoters of new submarine or land lines of telegraph have the advantage of the experience acquired by English companies during the last quarter of a century. English telegraph capitalists have found by dear bought experience that it is no light matter to maintain submarine cables in the neighborhood of coral reefs, or in an ocean bed which is subject to volcanic disturbances. The West India and Panama Telegraph Company has been thus far an unsuccessful concern, as it has had to contend with the coral reef difficulty; and the Eastern Extension, Australasia and China Telegraph Company is troubled every now and then with a volcanic disturbance in the Malay Archipelago, which is the volcanic region *par excellence*. The proposed Pacific telegraph might not be exposed so much to difficulties of this kind; and, at any rate, submarine telegraph projectors have learned the necessity of making careful surveys before they submerge their cables. On the other hand, the existing English companies have hitherto had undisturbed possession of the territories in which they work. This, of course, is something, and the experience which they have purchased rather dearly ought to stand them in good stead. But the great lesson which English submarine capitalists should lay to heart appears to us to be the necessity of working at the lowest possible rates. The more cheaply, for instance, cablegrams can be forwarded from London to Australia, British India and North and South America, the less risk there must be of loss of business by competition. We may sum matters up by observing that it is to the interest of British telegraph capitalists that they should make their charges as low as possible, that they should keep their dividends down to moderate levels, and that the largest possible reserve funds should be accumulated so as to provide for ultimate eventualities.

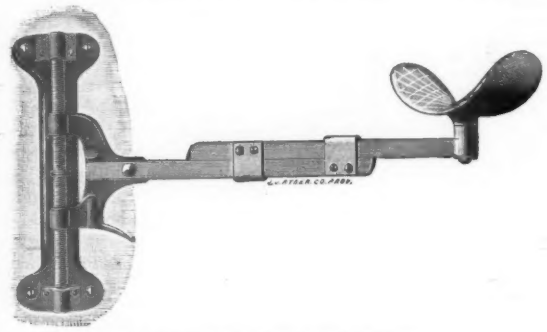


FIG. 1.—A TELEPHONE ARM SUPPORT.

A Telephone Arm Support.

A device which is meeting with a great deal of success, and which confers ease and comfort on the user, is a telephone arm support manufactured by the Woonsocket Edge Tool Company, of Woonsocket, R. I., and which is illustrated herewith. In the first place it does not mar the telephone set, as it is fastened to the wall at the side of the 'phone. It is equally applicable for use by a left-handed or right-handed telephone subscriber.

This rest will permit of any movement of the body of the operator. There is no liability of the parts slipping or breaking, as they are durably constructed and connected. It may be adjusted longitudinally, vertically and laterally, and when not in use may be thrown out of the way. It is raised by simply raising the bracket or rod, and lowered by raising the outer end of the ratchet lever to free it from the shoulders of the rod, when the weight of the rest and bracket will allow it to drop to the desired point. The swivel socket allows the speaker to easily turn and speak to a person in the room without hanging up the telephone.

FIG. 2.—TELEPHONE ARM SUPPORT IN USE.

The prices of the device, which is made in three styles, are moderate and should ensure its wide introduction.

The electric light plant at Cherokee, Ia., will be improved by the addition of another engine, the present power being inadequate to supply the increasing demand for light.

A Compact, Cheap and Powerful Magnet.

In the manufacture of electro magnets, as is well known, it has heretofore been the usual practice to have all the wire insulated with cotton, silk, or some similar fibrous material, and to wind but one wire at a time, and exceptions have been made from this rule only in compound wound magnets and induction coils, in which cases two wires have been wound simultaneously.

A recent invention of Mr. Richard Varley, Jr., for which a patent was issued to him on January 3, is quite a departure from the above and existing practice and, as will be seen by the accompanying illustrations, is nothing short of a complete change or inauguration of a new method of manufacturing electro-magnets. This simple invention enables the manufacturer of electrical apparatus which need a great number of electro-magnets not only to make magnets cheaper, but more compact and at the same time more efficient. The duplex magnet for the same strength requires less space than the magnets in use to-day. A material saving in the cost of manufacture is effected because where a magnet is now built up wholly of insulated wire, owing to the high cost of this material, it is a somewhat expensive operation. By the duplex method only one-half of all the wire on the magnet is covered, the other half being bare and the insulation of the covered wire serves to keep the turns separated, a layer of paper insulating the different layers.

The method of winding the duplex magnet requires a special machine, which has also been invented by Mr. Varley. Two wires being wound at the same time create four ends to each spool, as is shown in Fig. 1, *D* being an insulated wire, *E* bare wire, and *C* paper separating the layers. In the case of a single spool magnet the separate windings are shown connected together in series, Fig. 2, or, as shown in Fig. 3, where two spools are in close proximity; if desired, the different windings on each coil can be connected across in series, or singly, as in Fig. 2. Fig. 4 shows a single spool magnet complete as it comes from the winding machine, and the four ends, coming out as they do, make any combination of circuit that may be desired easily possible, series, parallel or differential. The very nature of the method of manufacture creates these conditions. Fig. 5 shows an electric bell of the ordinary type using duplex magnets. It seems peculiar that up to the present time no practical or radical improvement has characterized the manufacture of this fundamental part of electrical apparatus.

In certain classes of apparatus, where space is a very desirable element, it has heretofore been impossible to condense the magnets without impairing their strength. With the duplex method it is possible to reduce the size of a magnet very materially without decreasing its strength, and this

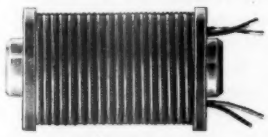


FIG. 4.—A DUPLEX MAGNET.

feature will probably be most appreciated by those who have to design and operate stock tickers, railway signals, annunciators, telephone appliances, etc.

In making electro-magnets for service where very slight currents are used, a high degree of insulation is not needed, as there is no danger of disruptive discharge; consequently the double fibre separation ordinarily used is unnecessary.

In making magnet wire the yarn which covers it must be of sufficient strength to stand the action of the machinery used for placing it on the wire. The result is that the diameter of the wire is very much increased and the convolutions of a magnet are often farther apart than is necessary. The magnet approaches its ideal efficiency when all the limiting space is entirely occupied by energizing current without any intervening air space.

In other words, the available space for the wire around the core should be utilized as completely as possible, and should contain no more non-conducting material than is absolutely necessary. The length of wire should be as small as possible for the required number of windings and should be wound as closely as possible, as the more compact and uniform a magnet is made the greater will be its efficiency. These, of course, being ideal conditions are impossible in practice, yet it will be seen that the duplex magnet approaches them. The valuable space which we gain with one-half of the insulation removed renders it possible to make the magnet more compact. Thus an improvement is made in two ways—in economy and efficiency.

Fig. 1.

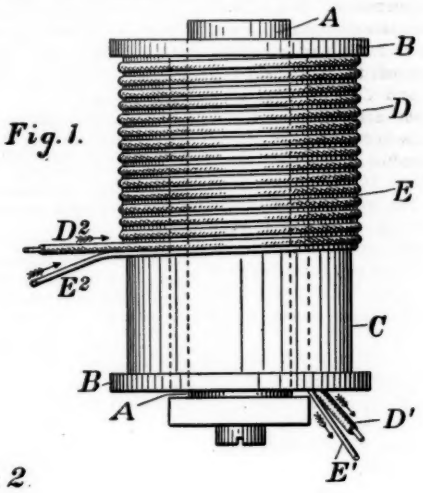


Fig. 2.

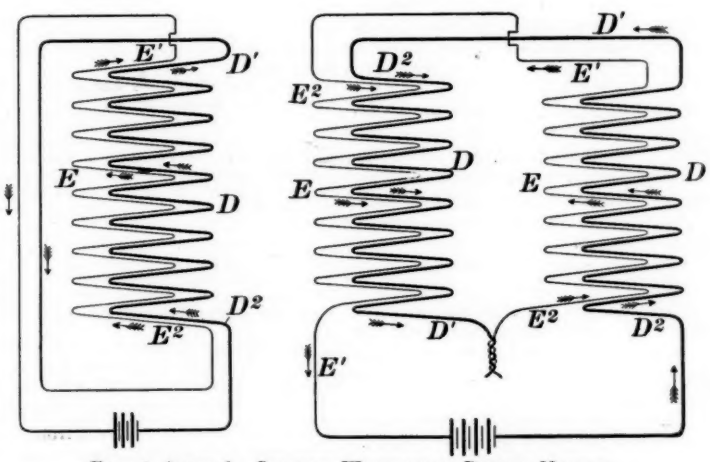


Fig. 3.

FIGS. 1, 2 AND 3.—SHOWING WINDINGS OF DUPLEX MAGNET.

The Varley Duplex Magnet Company, of 136 Liberty street, New York, has been organized for the purpose of introducing this invention.

FINANCIAL NEWS.

The Edison Electric Illuminating Company, of Boston, has declared a quarterly dividend of two per cent., payable February 1, to stock of record January 10.

On the application of the Thomson-Houston Electric Company, of Boston, Mr. H. G. Allis has been appointed receiver of the Camden Electric Light and Power Company.

Bondholders and capitalists of Boston, Keene and Nashua, N. H., have purchased the Wichita Electric Railway at Wichita, Kan., through the sheriff, under a mortgage of $300,000.

Clapp & Company, brokers of 60 Broadway, New York, state in their weekly letter that Edison Electric is in favor with a large circle of well-posted people, who predict higher prices.

It is said that the quarterly dividend of the Edison Illuminating Company, of New York, will be increased to one and one-half per cent., and that there may be a privilege to subscribe to a new issue of bonds.

The directors of the General Electric Company have declared a quarterly dividend of two per cent. on its common stock, and made the same payable February 1 to stockholders of record January 14.

The Southwestern Telegraph and Telephone Company reports that the capital of the company is $2,000,000, all paid in. The debts of the company do not exceed $100,000, and the assets equal at least $100,000.

The People's Passenger Railway Company, of Philadelphia, carried 32,947,062 passengers last year. The receipts from all sources for 1892 were $1,129,218, expenses $745,983, surplus $483,234. Out of this there has been paid for interest and fixed charges $259,884, leaving net earnings of $223,349. Two dividends of $1.25 each per share on the preferred and common stock of the company were paid, amounting to $207,300, leaving a net surplus of $15,849.

The attempt to organize a large passenger railway, embracing all lines outside the Philadelphia Traction, with one exception, has failed, although another effort to put the scheme through may be made shortly. There were too many conflicting interests, and some of the companies wanted too much for their property. The heavy buying of People's recently is said to be due to the efforts of a New York syndicate, headed by H. B. Hollins & Company, to secure control.—*Boston News Bureau.*

The Detroit Electrical Works, needing more capital, propose the issue by the company of $500,000 of its capital as preferred stock, entitled to eight per cent. cumulative dividends. This stock is to be offered first to present stockholders *pro rata* at the par value of $10 per share, "and then to stockholders and other parties at the best terms obtainable." The $250,000 common stock now in the treasury will be offered *pro rata* to purchasers of the preferred stock as a bonus. A meeting of stockholders to vote upon this plan will be held at Detroit, January 18. The peculiar feature of the plan is that it provides that the preferred stock is to have priority over other stock in the event of final dissolution of the company; that is, not only is there an eight per cent. cumulative preference on earnings, but also a preference on assets in case of liquidation.

ELECTRIC LIGHT FLASHES.

Georgetown, Tex., wants electric lights.

Kendallville, Ind., wants electric street lights.

The Somerville, Mass., Electric Light Company will increase the capacity of its plant.

The Allegheny, Pa., electric light plant was damaged by fire on January 8, to the extent of $5,000.

The Chicago Edison Company will begin the erection of a three story office building, 30x62 feet, at Nos. 1 to 3 West Madison street.

The council of Oakesdale, Wash., has passed an ordinance giving to the Oakesdale Electric Light Company a franchise for 30 years.

The electric light plant installed by the Western Electric Company in the new city hall, at Cincinnati, was tested on January 7, and found to work satisfactorily.

If we cannot have the electric lights we need, we can stretch out new railways and fill the dark places of the city with headlights.—*Springfield, Mo., Democrat.*

The Edison Lamp Works at Harrison, N. J., advertised last week in the New York papers for girls, presumably to work in the incandescent lamp-making business.

The Electric Light and Power Company, at Lock Haven, Pa., contemplate making important additions to their plant next spring, including extensions and reserve power.

At the electrical department of the Philadelphia and Reading Railroad Company, in Reading, electric light plants are being prepared for Coxeton, in the coal regions, and Port Reading, N. J.

The Fort Wayne Electric Company, through its New York State agent, has made a proposition to light the village of Palmyra, N. Y. A franchise will be awarded to the Fort Wayne or some other company at an early date.

The Providence Steam Engine Company has built two Green engines for the Pennsylvania Railroad Company's electric light plant at Pittsburgh. Each engine drives two 50-light Thomson-Houston arc and two 600-light Westinghouse alternating dynamos.

For some months past, Alton, Ill., has been engaged in a fight with the Alton Gas and Electric Light Company, which had the contract for lighting the city, and owing to

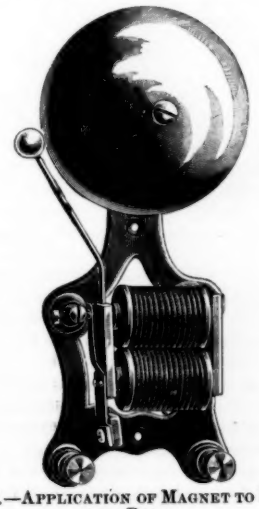


FIG. 5.—APPLICATION OF MAGNET TO ELECTRIC BELL.

complaints of the service when the contract with the city expired with the year the city refused to renew the same. The company then presented a new contract at an advanced rate, and said that if not accepted the lights would all be turned out on January 1 and the city left in darkness. The city has refused to accept the contract. In the meantime an Eastern syndicate proposes to buy the existing street car lines, change the motive power to electricity, and light the city as well.

The Little Woman at Lone Pine Station.

BY CHARLES B. LEWIS, IN THE NEW YORK "SUN."

In the building of the first great trunk line of railroad across the continent upward of 10,000 men were killed by the Indians or met death through sickness or accident. During the first three or four years of train service tramps and toughs and terrors made life a burden for all train conductors, and the small stations were entirely at their mercy. There were plenty of telegraph operators out of a job who could not be induced to take a lone station at any salary, and sometimes the company had to send three men to a station where there was little or nothing for one to do.

Lone Pine station was up in the mountains, just at the east end of a long stretch of snow sheds. It was 13 miles from Bad Creek to the west and 11 from Big Rock to the east. The names of these stations, together with dozens of others, have since been changed. At the date I write of a man named Clark had the Big Rock station, I had Bad Creek, and a new agent and operator had just taken possession of Lone Pine. That station had been vacant for a week. It had been held by a young man named Reed for about three months, but one night he was found dead and robbed—the work of the lawless element then overrunning the West. The first news I got from the new agent came from herself over the wire one day, and this is what she said:

"Allow me to introduce myself as Mrs. Hadley, the new agent at Lone Pine. I am just out from Chicago. Charming place this, and I know I shall like it. Hope to become better acquainted."

I found out later that she was a widow, about 26 years old, good looking, well educated, and possessed plenty of courage and common sense. Just why she didn't do as most other young widows do was no one's business but her own. Finding that she must earn her own living, she learned telegraphy, and came down the road in search of a place. They didn't want to give her the station at Lone Pine, but she was so persistent that she was finally installed. As at many other stations, she had to gather her own firewood and cook her own provisions, and there were many annoyances to be encountered.

Clark and I were both knocked out to find that a woman had been sent to Lone Pine. Had it been a man we should have expected him to take care of himself, but, as it was, we couldn't help but worry. There was hardly a day that we didn't have to drive some tough out of our houses at the muzzle of a shotgun, and both of us had twice been held up and cleaned out by gangs. Her station was even more isolated, and though her sex might be respected by some, there were men abroad as wicked as the old-time pirates. In response to our inquiries, she assured us that she had been provided with the regular outfit of weapons by the company, and that she should not hesitate to shoot if she found it necessary.

It was in May when the little woman took possession. In describing her I did not say that she was little, but such was the fact. Her weight was not over 100 pounds, and she looked more like a girl of 16 than a woman of 26. I got a chance to run up and see her one afternoon in the month, and found her nicely settled. She had been more or less annoyed by roughs, but there had been no occasion to test her nerve as yet. I found her double-barrelled shotgun loaded with buckshot and her navy revolver ready for business, and she assured me that she should not hesitate to fire upon any man who menaced her safety.

I went home much relieved in mind. Outside of the fraternal feeling so strong among the brotherhood of the key, there was something in the thought of that little woman being perched up there alone among the grim hills and wild forests calculated to keep a man awake when he should have been sound asleep on his cot. The first alarm came one night early in July. In the forenoon of that day two very rough looking men had come up the track from the west. They halted at my station, sized me up, and then demanded something to eat. I might have given them a bite had they requested instead of demanded; but when I saw that they meant to pick a quarrel and have an excuse for assaulting and robbing me, I brought out the shotgun and obliged them to walk on. As soon as they were out of sight I notified the little woman at Lone Point to look out for them. She replied that she would, and up to 10 o'clock at night I heard from her every hour, but the tramps had not put in an appearance. It was 11.30 o'clock and I was sound asleep when I heard Lone Pine call me over the wire. I rolled off my cot and ran to the instrument and asked what was wanted.

"The tramps are here," was the reply. "They are knocking on the door and asking for food and shelter."

"But don't let them in. Get down your shotgun, lay it across the table, with the muzzles pointed at the door, and if they break in pull both triggers."

"They are cursing me and declaring they will set the cabin on fire if I don't open the door," telegraphed the little woman a moment later.

"If you open the door they will murder you. You have a sliding window to the right of your door, if I remember right?"

"Yes."

"Take your revolver, slide the sash back, and fire upon the fellows."

"But I may kill one of them."

"That's what you want to do—both, if possible. If you show any fear of them they will batter the door in, and then God help you!"

"It's awful to shoot——"

Then came a break. I knew that the fellows were making some demonstrations which obliged her to act, and during the next 60 seconds I heard every beat of my heart. Then came the tremulous message:

"I—I've shot one of them, and what—what—shall I do about it?"

"Did you fire from the window?"

"Yes."

"Don't do anything, except wait and watch. If you've hit one the other will likely make off. If he tries to get in, however, give him the same dose. Do you hear him about?"

"No; I think he's moved off, but the one I shot is groaning and taking on awfully."

"Let him groan. You'll have a train from the east in 35 minutes. Keep me advised."

I had two more messages before the train reached her. One was that the man had ceased to groan and was probably dead, and the other was that the other tramp had tried to burst open the door, but had been driven off by her firing one barrel of her shotgun into it from her side. When the train rolled in a dead man was found at the door and a wounded one lying on the ground a few yards away. There wasn't any inquest on the dead. The body was carried a few miles west and dropped into a gulch, and the wounded man, who had half a dozen buckshot in his shoulder, was turned over to the first sheriff. The little woman's adventure made her a heroine for many weeks, and I was not mean enough to let on that I had been obliged to brace her up and direct operations from a distance of 13 miles.

Everything went well at Lone Pine until the 13th of September. That fall there was a regular army of tramps headed for the West, and the employés of every passenger and freight train had to be armed to the teeth. In some instances the gangs took possession of freight trains and ran them to suit their own convenience. The number of trainmen killed or wounded every week was something astonishing. On the 13th a gang of twenty tramps seized a freight train at a water tank twenty miles east of Big Rock and ran it to that station. There happened to be a big construction gang at Big Rock, and they turned to and overpowered the tramps and scattered them in every direction. It began raining at 2 o'clock in the afternoon, and when night fell it was as dark as pitch. At 8 o'clock a train loaded with bridge material and accompanied by 12 mechanics reached my station from the west on its way to Big Rock.

Just as it came in I got word from Clark over the wire that a landslide had occurred between him and Lone Pine, and no trains would be able to pass it before next day. This, you will observe, cut Lone Pine off on the east, and it held the bridge train at my station. I turned in about 11 o'clock, with the rain coming down as if everything was to be drowned out, and it was just half an hour after midnight when I was called by the little woman at Lone Pine.

"I'm sorry to disturb you," she said, "but I fear I'm going to have trouble."

"What's wrong?"

"A number of those tramps who were bounced at Big Rock to-day have reached here and taken possession of two empty freight cars on the siding. The whole crowd is half drunk and raising Cain."

"If they have shelter and something to drink they won't be apt to bother you to-night. However, I'll sit up with you for a while for company's sake. Are your firearms loaded?"

"Yes. The gang appears to have four or five revolvers, and two bullets have been fired through the window."

"Well, don't show any light, and you had better bunk down on your cot. The fellows will get over their hilarity pretty soon."

It was five minutes before I heard from her again. The engine of the freight train was standing almost opposite the door, and during the interval I went out and roused the sleeping engineer and fireman and told them what was going on at Lone Pine. If things got desperate with the little woman I proposed to take half a dozen of the mechanics and go up to her relief. When she called me again she said:

"One of the gang has routed me up and demanded whiskey and something to eat. When I ordered him away he made threats of what they would do."

"Don't get shaky," I replied. "It's probably a bluff. Construction No. 8 is lying here, and in case you need help a lot of us will come up on the engine. We'll have a clear road and can make it in fifteen minutes."

It was seven minutes before she called again. The locomotive had been fired up, and the fireman had gone back to the caboose and routed out six men who had revolvers, and they were ready to make a dash with us.

"You remember the old caboose car at the end of the side track?" queried the little woman at Lone Pine.

"Yes."

"Well, they have made a bonfire of it, and it's blazing away even in this rain. There are 14 of the fellows and the toughest lot I've ever seen. I think they mean to attack the house. Hadn't you better come up?"

"I don't want to take the responsibility unless it is positively necessary. You are expected to stand them off if you can. No one will blame you if you wipe out the whole gang. Talk right up to them if they come to the house."

Three or four minutes slipped away, and then she announced that they had given her five minutes in which to surrender, and that one of the empty freight cars had been fired.

"They can't set fire to the house with the water falling like this," I replied. "You have a stout shutter at the window, and they can only attack by way of the door, if at all. They can't shoulder it in with two bars across it, and if they bring up a battering ram you want to fire on them through the lower panels."

What was to be the last message came about ten minutes later.

"They brought up a beam," telegraphed the little woman, "and I gave them the buckshot through the lower panels. I think I hit three or four. Some of them are now firing into the house, while others are bringing up firebrands to burn me out."

"Coming—don't give up!" I rattled off to her, and thirty seconds later the engine was moving away with our crowd. We had a wet track, but a clear run, and after the first two miles we simply flew. We had some fear that the fellows might have turned the switch or pushed a freight car down on the main track, but no such idea had occurred to them. We went through two miles of snow shedding like a rocket shooting along a tube, and when we popped out at the eastern end we were among the tramps. The two cars were blazing away and a fire had just been started in a third. Firebrands were piled up against the house at three different places, and three or four fellows with revolvers were blazing away at the door and window.

Before the engine had come to a stop we dropped off and began shooting to kill, and in five minutes we had cleaned out the gang. Perhaps you remember the way that certain newspapers pitched into us about that affair, calling it a massacre, and howling for our arrest. There were four killed and seven wounded. Three men were hit when the little woman fired through the door. I know what became of the killed, for I helped to bury them, but the wounded were taken East that afternoon.

When the little woman opened the door to us she had her revolver in her left hand, because one of the stray bullets had passed through the palm of her right. She had also been grazed on the shoulder, and two bullets had passed through her clothing. She had fired both barrels of the shotgun and 11 bullets from the revolver, and was doing bravely well when we turned the scales. And did she continue at Lone Pine? Oh, no. A division superintendent fell in love with her, re-aroused the tender passion in her breast, and away she went to settle down on the Pacific slope and become a nobody—that is, she couldn't be a heroine any more.

Difficult Maintenance of Telegraph Lines.

In the tropics the maintenance of a telegraph line in good working order is a constant uphill fight against all manner of interrupting enemies that linemen and operators in this latitude never dream of. In Brazil the wires get tangled up with the cable-like web of an immense spider, which, dripping with dew or rain, makes cross connections, short circuits and grounds almost daily. Ants often destroy the poles in a few weeks. Monkeys swing on the wires and break them, and in the forests creepers and rope-like withes overgrow the poles and the wires every few weeks. All this is more or less true of all Central and South America. In Cuba there is an orchid that incrusts the wire and causes leakage.

In the West Indian Islands the John Crows, or turkey buzzards, make life miserable for the telegraph and telephone people. These big heavy birds, the only scavengers, are around in great numbers. They roost on the wires or fly up against them, and invariably break them short off. In one large town the telephone lines that ran by the public market had to be put underground because the buzzards congregated there in great numbers, rested on the wires and broke them almost nightly. On the pampas of Argentine the herds of practically wild cattle rub and butt against the poles and frequently break them down. For some years it was altogether impossible to maintain a line of telegraph through Persia for more than a few days at a time; the natives regularly destroyed it as a device of the evil one. Finally the Shah issued an edict making the loss of an ear the penalty for a first offense of destroying the telegraph line; the loss of a hand for the second, and death, by being buried to the neck in the sand beside the telegraph line, the penalty for a third offence. One-eared men were common in Persia for several years, for the Shah was determined to introduce civilizing influences.

New Year's Favors.

The Berkshire Life Insurance Company, of Pittsfield, Mass., sends out a very artistic calendar lithographed in colors.

Holmes, Booth & Haydens, Waterbury, Conn., have favored us with a neat and serviceable calendar announcing their brass specialties.

The Phosphor-Bronze Smelting Company, 512 Arch street, Philadelphia, have sent a splendidly executed steel engraved calendar showing an interesting scene in their foundry.

Mr. W. A. Stadelman, general manager of the Bristol, Tenn., Belt Line Railway Company, has sent an annual pass over his road to the Editor of the ELECTRICAL REVIEW. The compliment is appreciated and the privilege will be utilized at the first opportunity.

The Mather Electric Company has sent us one of the most elegant holiday souvenirs we have yet seen. It is a leather tablet designed to stand upright and is illuminated in gilt with a tasteful reminder of the Mather apparatus. The right hand side is occupied by an erasible memorandum blank. In the upper left hand corner is a monthly calendar, and below this is a little clock, which up to date has kept splendid time. The Mather Electric Company is certainly generous with its friends, and it is hoped that this souvenir is an evidence of the prosperity which will attend the company during 1893.

ADVANCE INFORMATION.

New Electric Companies Formed and Important Constructions Projected.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week:

New Electric Railways.

CHICAGO, ILL.—The West Chicago Street Railway Company, of which Mr. Chas. T. Yerkes is president, has voted to double its capital of $10,000,000. The earnings of last year were nearly 14 per cent. The North Chicago Street Railroad Company, of which Mr. Yerkes is also president, has increased its capital from $5,000,000 to $10,000,000.

CHICAGO, ILL.—The Chicago Street Railway Company, which has used cable for years, has adopted electricity. This move was made especially to take care of the World's Fair traffic.

READING, PA.—In the Reading common council the bill granting to the City Passenger Railway Company the right to use the trolley on all its lines has been passed. The permission extends to about 35 miles of track, reaching all parts of the city.

WORCESTER, MASS.—The Worcester and Shrewsbury Railway Company will build an electric street railway from Worcester, through Shrewsbury and Northborough, to Marlborough, and will ultimately change its narrow gauge road to Lake Quinsigamond into an electric line.

WINDSOR, ONT.—The Sandwich, Windsor and Amherstburg Railroad has been sold to W. Ryckman and others, of Hamilton, for $155,000.

LONG ISLAND CITY, N. Y.—The system of street railways in Long Island City, about 38 miles of track, has been purchased from Wm. Steinway by R. T. McCabe, Benj. Orne and G. Van Nostrand. The new owners propose to introduce electric traction over the entire system.

JAMESTOWN, N. Y.—A. N. Broadhead, A. C. Wade and C. M. Dow, of Jamestown, have received a franchise for an electric railway through the village of Sayre. The proposed road will run from Waverly to Athens, through Sayre, a distance of six miles.

PONTIAC, ILL.—The Pontiac Street Railway Company, capital, $100,000, has been incorporated by J. E. Monree, R. M. John and others.

ATCHISON, KAN.—The Atchison city council has granted a franchise to the Atchison Electric Street Railway and Power Company. The company is composed of local capitalists, who propose to construct two lines of street railway next spring.

IONIA, MICH.—It is proposed to build an electric railroad to the House of Correction.

LANCASTER, PA.—The Lancaster and Marietta Street Railway Company has been incorporated with a capital of $90,000.

MONTGOMERY, ALA.—The Montgomery and Terminal Street Railway Company will equip its entire system of street and suburban railways with electricity.

BURLINGTON, VT.—About $40,000 of the capital stock for an electric railway between Saxton's River and Bellows Falls has been subscribed.

NATCHEZ, MISS.—The board of aldermen has passed an ordinance authorizing the Natchez Street Railway Company to construct and operate an electric railway in this city.

CUMBERLAND, MD.—Articles of incorporation for the Lonaconing and Cumberland Electric Railway Company have been filed by J. J. Bell and George A. Clark, of Lonaconing; J. B. Stewart, of Washington, and F. V. S. Turner, of Georgetown.

BROOKLYN, N. Y.—The Brooklyn City Railroad Company has been refused a franchise to run an electric road through Flatlands, the privilege being secured by the Kings County Electric Railway Company.

SANTA ROSA, CAL.—The charter of the Union Street Railway Company has been filed. The line will run from this city to Taylor Springs and Rincon Heights and will be operated by electricity.

HOLYOKE, MASS.—The Holyoke Street Railway Company has empowered a committee to confer with the Springfield Street Railway Company relative to effecting a consolidation of the two systems.

DENVER, COLO.—The Denver, Mount Olivet and Golden Railroad Company; capital stock, $125,000; incorporators, Daniel Sayer, of Denver; Charles Fish and Elwood Easley, of Jefferson county. In addition to the railroad, the company will construct telegraph lines.

BRISTOL, PA.—A movement is on foot to build a line of electric road from Bristol to Newtown, *via* Hulmesville and Langhorne.

DEDHAM, MASS.—All the capital stock of the Norfolk Suburban Street Railway Company has been subscribed. The proposed electric line will begin at Dedham Centre and run through Dedham and Hyde Park to Mattapan.

DETROIT, MICH.—The Detroit, Pontiac and Northern Railway Company has been incorporated with a capital stock of $500,000. This is understood to be the plan to connect Royal Oak, Birmingham and Pontiac with Detroit by means of an electric railway.

DENVER, COLO.—A. M. Mayfield, Wm. Story and Abram Humphrey, have incorporated the Mayfield Coal Mine, Toll Road and Electric Railway Company. It proposes to build along the said toll road an electric railway.

PACIFIC GROVE, CAL.—The Pacific Grove, Monterey and Del Monte Electric Railroad Company; capital, $500,000. Incorporators, J. T. McCrossan, Wm. H. Chapman and Geo. W. Hopkins. The company will build an electric railway from Pacific Grove to Monterey and the Hotel Del Monte, a distance of about five miles.

FAIRFIELD, ME.—The Maine Railway, Light and Power Company will ask the legislature for a charter. The scheme looks toward the centralization of the Maine electric railways and light plants. The prime mover in the company is A. F. Gerald, of Fairfield.

BROOKLYN, N. Y.—The Twenty-third Street Ferry and Newtown Railroad Company; capital, $750,000. Incorporators, Moses May, John J. Cooney, J. G. Jenkins and Theodore F. Jackson. The tracks will be laid through the principal business streets in the eastern district, and will be about six miles in length.

COLUMBUS, O.—The Columbus and Harrisburg Electric Street Railway Company; capital, $1,500. Incorporators, Joseph M. Briggs, Adam G. Grant and Gideon D. Martin.

CARTHAGE, MO.—The Carthage horse railway is to be changed to an electric line, and a new company is being formed to put in another electric line on streets not already occupied. The promoters are represented by C. L. Bartlett and H. H. Harding, who have petitioned council for a franchise.

WOOSTER, OHIO.—The city council has granted a franchise for an electric street railway to the Thomson-Houston Company, of Cleveland.

PITTSBURGH, PA.—An electric railway company, called the Charleroi, Monongahela City and West Brownsville Company, capital, $700,000, has been formed. The line will run from Pittsburgh to Birmingham, Homestead, Braddock, McKeesport, Reynoldsville, Monongahela City, Allentown, Lucyville, Charleston, Woods Run, Coal Centre and West Brownsville. The road, when completed, will be 58 miles long.

WAVERLY, N. Y.—The Susquehanna Valley Electric Traction Company; capital, $20,000. Directors, Almet N. Broadhead, Charles McDow, S. B. Broadhead Wm. Broadhead, Arthur G. Wade and, Orsino E. Jones, of Jamestown, N. Y.

HOMESTEAD, PA.—The Homestead and Highland Street Railway Company has been granted right of way over certain streets of the borough.

PLAINFIELD, N. J.—Overtures have been made by an electric railway syndicate to the Plainfield Street Railway Company to join in a scheme by which Plainfield, New Brunswick and Bound Brook will be connected by a system of electric railways.

HAVERHILL, MASS.—It is reported that the stock of the Haverhill, Merrimac and Amesbury Electric Railroad Company is to be pooled with that of half a dozen other electric roads in New England. Among the roads which will be affected are those in New London and Norwich, Conn.; the South Shore line, Plymouth, Mass., and the Bangor, Me., system. The consolidated companies will form one of the largest companies in the business.

LONG ISLAND CITY, N. Y.—There is but little doubt that an electric line will be built from Flushing to Long Island City, but whether it will be constructed by Mayor Gleason or a syndicate, represented by D. S. Jones, of Flushing, is a question which interests a number of people. Both claim to have right of way.

ST. LOUIS, MO.—The Chicago and St. Louis Electric Railway Company has filed a certificate of the increase of its capital from $1,000,000 to $7,000,000.

NORTHUMBERLAND, PA.—The Northumberland and Allenwood Street Railway Company; length, 18 miles; capital, $180,000. Promoters, Alex. Farnham, George H. Butler and J. I. Higby.

PEEKSKILL, N. Y.—This village is to have an electric railway. The scheme, if carried out as now proposed, will make a line several miles long, and will connect Verplancks Point, Peekskill, and the State Camp of Instruction, which is situated a short distance from the village. Power can be obtained from the electric light station which is already installed. Local capital is interested in the project and the plans will be consummated in a few weeks.

NEW HAVEN, CONN.—The New Haven and Westville Railroad Company will build an electric power house.

Electric Light and Power.

DETROIT, MICH.—The Edison Illuminating Company has increased its capital from $300,000 to $350,000.

PORT HURON, MICH.—The Excelsior Electric Light Company has increased its capital to $150,000.

AUGUSTA, GA.—The Thomson-Houston Electric Light Company will increase its capital to $500,000.

PUEBLO, COLO.—The Central Colorado Electric Supply and Manufacturing Company; capital, $100,000. Incorporators, Moses Franklin, E. H. MacDermott, Thomas Neelson and H. W. Preston.

HOPE, ARK.—W. J. Williams, of Dallas, Texas, will erect an electric light plant at Hope.

CLEVELAND, O.—The Cuyahoga Electric Company; capital, $25,000. Incorporators, Noah S. Armstrong, Wm. P. Caulkins and Geo. G. Sowden.

MOUNT CARMEL, ILL.—The council has perfected arrangements with a Chicago firm to put in a combined electric light and water works plant at a cost of about $50,000.

ALBANY, N. Y.—The Burton Electric Company; capital, $10,000. Incorporators, Paul G. Burton, Howard Martin, of Albany, and Chas. F. Frey, of Greenbush.

LOVINGTON, ILL.—The Lovington Electric Light Company; capital, $5,000. Incorporators, Wm. J. Day, G. M. Stivers and S. P. Drake.

CHICAGO, ILL.—The Electric Battery Company; capital, $10,000. Incorporators, Frank L. Malmstedt, Martin R. W. Russell and Victor Bronson.

MENARD, ILL.—The Chester Light, Water and Ice Company; capital, $35,000; to furnish electricity, etc. Incorporators, John D. Gerlach, Geo. L. Edwards and Wm. H. Bryan.

PETERSBURG, IND.—The Petersburg Electric Light, Power and Water Works Company; capital, $10,000. Incorporators, G. Frank, C. A. Burgen and G. E. King.

CHICAGO, ILL.—The Independent Electric Company; capital, $25,000. Incorporators, Wm. F. Hall, D. G. Hicks and M. D. Levin.

AMHERST, MASS.—The Electric Light and Gas Company will add a larger engine to have sufficient power to drive a 1,500 light dynamo.

QUEBEC, CAN.—The Quebec Electric Light Company has purchased the power of the Falls of Montmorency, and will erect a large plant for light and power purposes.

BUTLER, PA.—Charters have been granted to the Pittsburgh Gas and Electric Fixture Manufacturing Company, capital, $10,000, and the Citizens' Gas Company, capital, $50,000.

SPRINGFIELD, ILL.—The Superior Electric Company has been incorporated with a capital of $300,000.

HARTFORD, CONN.—The Waterhouse Electric Company; capital, $20,000. Incorporators, Addison G. Waterhouse, Geo. L. G. Waterhouse and Frank G. Waterhouse. The company will manufacture and sell electrical apparatus.

New Manufacturing Companies.

PITTSBURGH, PA.—It is reported that the wire and wire nail interests in the United States will be consolidated. The most prominent mover is the Washburn-Moen Company.

WAVERLY, O.—The Columbia Telephone Company, capital, $5,000, has been incorporated.

NEWARK, N. J.—The Electrolier Manufacturing Company; capital, $100,000. Incorporators, Henry D. Sissons, Chas. H. Robinson and Wm. M. Wells, of Pittsfield, Mass., and Benj. E. Chapin, of Newark. The company is organized for the purpose of manufacturing and selling electrical implements, apparatus and electroliers.

DES MOINES, IA.—The Great Western Manufacturing Company. T. B. Casey, president; H. A. O'Dell, secretary and treasurer, and E. R. Gilman, general manager. The company will manufacture and sell electrical appliances and machinery.

DES MOINES, IA.—The Finney Motor Company; capital, $50,000. Incorporators, W. N. Williams, C. N. White and John Christianson.

KINDRED INTERESTS

The Iron Steamboat Company, Pier (New) No. 1, N. R., New York, is out with its summer excursion announcements for 1893.

A New York Safety Engine is to drive the electrical plant of the Harlem Wood and Lumber Company, 138th street, New York.

The Card Electric Dynamo and Motor Company, of Cincinnati, has been reconstructed and a new factory with greatly increased output will be built.

The New York Equipment Company, 15 Wall street, New York, has sent us several erasible vest pocket memorandum tablets which are neatly made and designed to serve a good purpose.

F. R. Chinnock, 18 Cortlandt street, New York, sales agent for the Ball Engine Company, of Erie, Pa., reports business good and states that he has lately closed several desirable contracts for Ball engines.

Watson & Stillman, proprietors of the "W. & S." Hydraulic Machinery Works, have issued a very complete and well illustrated catalogue of their improved hydraulic jacks. Electric construction companies will do well to send for one of these catalogues.

The "Handbook of Tables for Electrical Engineers," published by John A. Roebling's Sons Company, Trenton, N. J., is one of the most valuable volumes ever offered to the electrical engineering profession. No electrical worker should be without it. The price is $1.50 and the book will be sent post free.

Crompton & Company, Limited, Mansion House Buildings, London, E. C., have sent us a very complete illustrated catalogue of direct current dynamos, generators and motors. Reductions have been made in prices from those quoted in previous lists. The majority of these machines can also be used for the electro-deposition of copper, electro-chemical processes and electric welding.

The Superintendent as a Story Teller.

"When I first got my present job," said an electric light superintendent as he sat down on a barrel of lamps and chewed the caramel insulation off a sample piece of wire, "I enjoyed the free privilege of an entrance to all fairs and theatres. I am tired of them now and look in for only a few minutes to see the crowd and look at my lamps. One night the degraded order of copper-colored idiots started a trading post and fair. I tried to walk in to keep an appointment at 9 o'clock with one of the trustees of the organization about an increase of lights. A big fellow stopped me at the door: 'Electric light,' I said. 'I don't care who you are. You can't go in here without a ticket or paying.' 'My lights are in there and I am going in to see them.' 'No, you are not.' 'Well, then, you won't have any light.' 'Oh, you can't put them out.' I went out and turned a pole switch, put out the lights, and went back to see the circus I had created in place of the fair I wanted to see. At the door I met the trustee. He asked me what was the matter with the lights; that 400 people were in total darkness. I told him why, and he gave the big fellow a curtain lecture with spring roller attachment. Long after I passed the bully many a time and he made himself scarce." The superintendent shifted his position to a coil of wire, and lighting a telephone cigar gave us his second story. "At one time I installed a temporary plant at Stoughton, Mass., for a county fair. I gained admittance myself and so did my assistant, but his girl was stopped. 'Oh, she's my wife,' and the joke of it was the ticket taker was the girl's uncle. If my man had done that in New York he would have been a married man." Just then the telephone rang to bear the message that the moon had broken down up in the square, and arc lights would be in order.—*Electrical Progress and Development.*

The Proper Telephone Directory.

Various kinds of telephone directories have been gotten up, but what is needed is one with short stories interleaved between the lists that a man could read while waiting for the telephone girl.—*Springfield, Mass., Graphic.*

Wanted:

Man who fully understands refining copper anodes by electricity. Name salary. Address, with recommendations and qualifications,

E. A. E., this Office.

WANTED—A thoroughly reliable and competent man, who can take entire charge of the Braiding Department of a large Electric Wire Company.

Address, stating experience and salary expected,

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Care of ELECTRICAL REVIEW,

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Engine Lathes, 10 in. x 4 ft.; 11 in. x 5 ft.; 12 in. x 6 ft.; 14 in. x 6 ft.; 16 in. x 6 ft.; 18 in. x 8 ft.; 20 in. x 8 ft., with tapes attachment; 22 in. x 12 ft. and 14 ft.; 24 in. and 26 in. x 16 ft.; 30 in. x 10 ft. and 18 ft.; 36 in. and 38 in. x 20 ft.; 42 in. x 12 ft.; 27 in. x 32 ft.; 88 in. x 31 ft.; 96 in. x 20 ft. Fox Lathes, 13 in. x 5 ft.; 14 in. x 5 ft.; 15 in. x 6 ft.; 18 in. x 6 ft. Turret Lathes, 12 in. x 5 ft.; 14 in. x 5 ft.; 15 in. and 16 in. x 6 ft.; 18 in. x 6 ft.; 36 in. x 8 ft.

Planers, 16 in. x 16 in. x 3 ft.; 20 in. x 20 in. x 4 ft.; 24 in. x 24 in. x 6 ft.; 30 in. x 30 in. x 6 ft.; 36 in. x 36 in. x 10 ft.; 42 in. x 42 in. x 12 ft.; 44 in. x 48 in. x 22 ft.; 60 in. x 49 in. x 24 ft.

Friction Shapers, 15 in., 16 in., 20 in., 22 in., 32 in.

Crank Shapers, 6 in., 8 in., 10 in., 12 in., 13 in., 16 n., 17 in., 20 in., 24 in., 28 in.

Screw Machines, Nos. 1, 2, 3, 4, with or without Wire Feed.

Screw Machines, Nos. 5, 6, 7, 8, Power Feed.

Presses, Nos. 51, 52, 53, Ferracute; Nos. 1, 2, 3, Stiles & Parker.

5 Lincoln Pattern Millers, No. 2.

Hand Millers, Nos. 1 and 2. 3 Cam Cutters.

Bolt Cutters, ¼ in. to 1 in., ½ in to 2 in.

2 Profiling Machines. 1 36 in. and 48 in. Gear Cutter.

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Send for Illustrated Catalogue.

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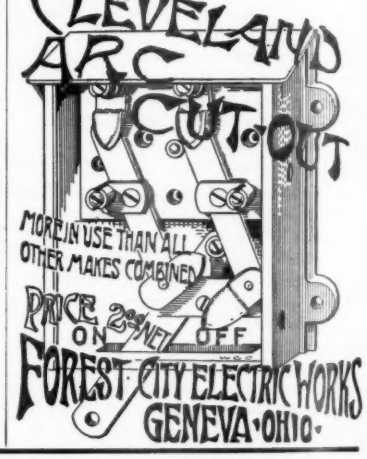
IF YOU want anything pertaining to electric machinery, send us your inquiries.

FRANK RIDLON & CO.,

Dealers in New and Second-Hand

Electric Light & Power Machinery,

196 SUMMER STREET, BOSTON.



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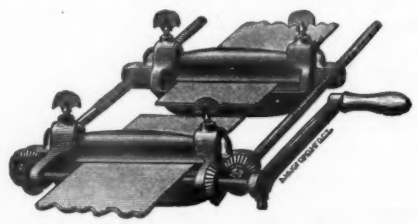

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